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THE CONDOR

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YELLOW GROSBEAK, *PHEUCTICUS CHRYSOPEPLUS*

Two-thirds natural size

Painting by Andrew Jackson Grayson

THE CONDOR

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OBSERVATIONS ON THE BREEDING BEHAVIOR OF THE RING-NECKED PHEASANT

By RICHARD D. TABER

The object of this study was to follow the behavior of individual, wild Ring-necked Pheasants (*Phasianus torquatus*), particularly cocks, through the breeding season in order to ascertain and interpret the various behavior patterns and apply this knowledge toward a better understanding of the total reproductive effort of this species.

The breeding behavior of the Ring-necked Pheasant in the wild has been studied and observed in part by many authors. Bent (1932) has assembled much of the work done in this country prior to 1931, including that of Leffingwell (1928); in addition, he quotes Millais (1909), the student of English game birds. Beebe (1931) and, more recently, Kozłowa (1947) have given partial descriptions of the breeding behavior of several members of the genus in their native habitats. Wight (in McAtee, 1945) was the first to describe the entire breeding season of this pheasant from the game manager's viewpoint; Hiatt and Fisher (1947) have critically examined some of Wight's findings and added new data. Baskett (1947) has made incidental observations on breeding behavior and examined the problem of territoriality. Einarsen (1945) has described some aspects of social friction in a high-density population. Several of these papers appeared subsequent to the inception of the present study in 1947.

The study area consisted of a 349-acre marsh lying along Nine-Springs Creek in the Town of Fitchburg, Dane County, Wisconsin, and the surrounding uplands. This marsh, which includes the Nevin State Fish Hatchery Refuge, is typical of winter pheasant habitat in southern Wisconsin. It has been described by Buss (1946:29), who did much of his work on pheasants in the area: "At one time the marsh . . . was a shallow lake, but drainage in 1922 converted it into a marsh which now consists of optimum cover for pheasants. A spring-fed stream flows from the Madison Fish Hatchery adjoining the marsh to the center of the marsh where it joins the drainage system. Numerous springs that arise within the marsh meander to the ditches. Both the spring(s) and the ditches are densely grown to water cress (*Radicula officianale*) The stream bank is grown to willows (*Salix* sp.), while the ditch banks are covered with a succession of giant ragweed (*Ambrosia trifida*), nettle (*Urtica gracilis*), and some elder (*Sambucus canadensis*). Dredging, plowing, grazing and burning at various times and places within the marsh have caused a variety of plant successions. Part of the succession is original and ungrazed." The principal winter roosting cover is formed by stands of *Phragmites communis* on slightly elevated areas and *Carex stricta* in the lower spots. The uplands are under cultivation, in part; the principal crops are corn, hay and small grains.

The various genetic strains of pheasant which have been interbred at the Wisconsin State Garm Farm have been discussed by Leopold and Grimmer (in Buss, 1946:15-17). While it is impossible to describe with accuracy the exact mixture represented by the wild pheasants on the study area, their appearance is that of *Phasianus torquatus* as described by Delacour (in McAtee, 1945:8).

Drive censuses of the study marsh were made by the staff and students of the De-

partment of Wildlife Management, University of Wisconsin, in the winters preceding the periods of observation, those of 1946-47 and 1947-48:

Date	Cocks	Hens	Total	Ratio
January 25, 1947	43	119	162	28:100
January 24, 1948	81	231	312	35:100

A crew of about 20 men in line systematically beat through the marsh, counting those birds which flew out of the marsh or into an area already covered. This census method is more fully described by Leopold (1943:383).

Trapping and banding of this population have been carried out during the winters from 1940-41 to 1946-47, inclusive. The complete file of trapping records at the Department of Wildlife Management for these years facilitated the checking of previous age and weight records for retrapped birds. In the seasons of 1946-47 and 1947-48, the author did all the trapping in this marsh; this afforded him opportunity to mark numbers of birds.

Season	Cocks trapped	Hens trapped	Total	Sex ratio	Previously marked Cocks	Hens
1946-47	12	85	97	14:100	10	62
1947-48	38	170	208	22:100	32	131

In 1946-47, the markers consisted of dyed chicken contour feathers glued to the pheasants' contour feathers, plastic tail plaques of the type described by Trippensee (1941), and plastic tags glued to the pheasants' contour feathers. In addition, each trapped birds was banded with an aluminum band on one leg and an overlapping plastic band (numbered) on the other.

Although a number of birds were identified individually during the following breeding season, the markers were not considered satisfactory. The following winter the marking problem was solved satisfactorily by use of a new type of marker (Taber, 1949). This marker consisted of a pair of numbered rubber film tags, one projecting in front of each wing, which were attached to a silver-plated safety pin fastened through a pinch of skin at the back of the bird's neck. In addition, each bird trapped the second season was banded with colored aluminum bands in an individual combination; these bands were colored by the Alumilite process of the Chicago Thrift Company.

The yearly period of observation started each season in February as soon as the first breeding behavior was noted. It extended until September 6 in 1947 and June 24 in 1948. Hours of observation totaled 204 on 116 days in 1947 and 82 on 52 days in 1948. In the first season, a limited area was studied intensively; in the second season, this intensive study was continued but an effort was also made to follow the seasonal changes of the whole population. Two 20-foot portable tower blinds, five tree blinds and eight ground blinds were used as the occasion warranted. Every effort was made to keep from disturbing the birds during periods of observation. Most of the observations were made with the aid of a 20× telescope loaned by the Wisconsin Conservation Department.

Since no phenological differences were observed in the two consecutive breeding seasons, the discussion is presented as though it pertained to a single season. The actual year in which an observation was made, however, is indicated in every case. The various stages of the breeding season have been related to the stages in the development of the gonads of cocks, as shown by a concurrent study of pen-reared birds (Greeley, MS).

THE EARLY BREEDING SEASON

Prebreeding season.—The prebreeding season lasted until late January. In December and January, the pheasant population was distributed generally through the marsh. While a few birds left the marsh in the daytime to feed in shocked corn in the nearby

uplands, the bulk of the population fed in the marsh. All birds roosted there. There seemed to be a rough segregation of sexes. Although the birds were generally in groups, the composition of each group was continually shifting (Collias and Taber, MS).

During this period, the only call heard was the cackle of the cock. This was given either as one flew off when suddenly startled or spontaneously from the ground, espe-

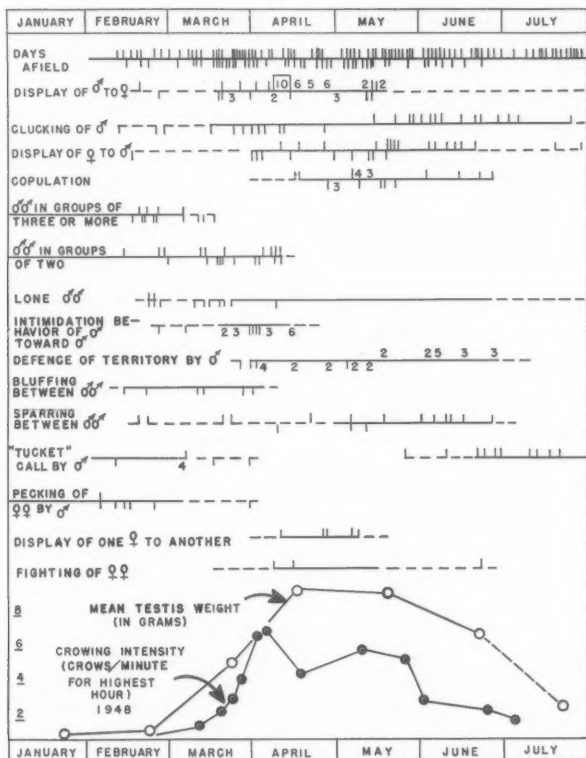


Fig. 21. Comparison of behavior with testis weight and crowing intensity. Figures above the lines indicate number of times behavior was observed on given date in 1947; those below lines, number for 1948; numbers of 10 or more are boxed. A solid line indicates behavior was common or continuous; broken line, rare or discontinuous. Data on testis weight obtained from Greeley, who examined 12 individuals per month from July, 1947, to June, 1948. Crowing records only for clear, calm mornings in 1948.

cially in the late evening. An evening cackle was sometimes answered by a second cackle from a different cock. This call has been described by Leffingwell (1928:24) as a tri-syllabic call, *tucket-tuck*; it is given in a series which trails away at the end.

The transition period.—The period of transition from the prebreeding to the breeding season lasted from late January to the middle of February. About January 20, a

new call was heard which seemed identical with the alarm call or two-syllabic *tucket* described by Leffingwell (1928:24). Since this call is reported to be an alarm note, and since it has been observed to be given by startled cocks at all times of the year (Aldo Leopold, verbal communication), it might be supposed that its occasional rendering about the end of January had no significance. However, since it diminished as crowing built up at the beginning of the breeding season, and became more common as crowing diminished at the end of it (fig. 21), I believe it to be a transitional call, indicative of a close approach to the crowing threshold. When heard in late January and early February, it was given in series, each *tucket* covering an interval of about half a second. It was unlike the cackle in that it did not terminate in a trailing diminuendo and was never given in flight.

In early February, there was a concentration of pheasants in that portion of the marsh which lay adjacent to the newly-manured fields. Whether the concentration was based wholly upon this new food supply or was connected with the urges of the incipient breeding season, I do not know; however, it was my impression that the concentration of birds began before the manure was spread.

Pecking of hens by cocks during feeding, indicative of sexual quiescence (Collias and Taber, MS) continued until mid-February (fig. 21). In late January and early February of both years, groups of from two to ten cocks began to work out from the marsh-edge in the daytime, returning to the marsh to roost at night. No sexual antagonism was detected among these birds at this time.

A study of the testis weights of southern Wisconsin pen-reared birds (Greeley, MS) showed that the testes were increasing in weight very slightly during this period from late January to mid-February (fig. 21).

Period of first breeding behavior.—The first breeding behavior took place between mid-February and mid-March. Wight (in McAtee, 1945:143) states that the behavior typical of the breeding season is first observed in the first warm days of February. Such was the case in both seasons in the present study. Male behavior patterns of the breeding season may be divided into those directed toward hens, or courtship behavior, and those directed toward cocks, or antagonistic behavior. A similar division may be made in the behavior of hens.

Courtship behavior.—In 1948, the most dominant cocks began to cluck and display to hens sporadically in mid-February (fig. 21). The clucking was of two sorts, a conversational cluck and a food call. The conversational cluck has been described by Kozłowa (1947:424) for *Phasianus colchicus bianchii* as "a number of confused, low cooing notes . . . coo - coo - coo - co - co - co - crow, with a slight howl at the end of the cooing, heard now and then." Also described by Kozłowa (1947:425) is the food call, which she calls "a softly muttered *kutj - kutj - kutj*." My observations agreed with these descriptions except that the food call as heard by me seemed to be rather clear and definite rather than softly muttered.

The display of the cock to the hen has been described many times. That observed in this study agreed with published descriptions in being a lateral display, the tail and back feathers of the cock being shifted toward the hen, the tail spread, the pinnae raised, the wing dropped, the contour feathers raised and the wattles swollen. With head held low and close to the breast, the cock strutted in an arc around the hen (fig. 22c). If she ran a few steps, as she usually did, he either stopped displaying or ran after her with head held low and against his breast and rump elevated (fig. 22a), and displayed again; if she stood still when he had completed his strut, however, he remained stationary in full display until she moved. As many as 12 displays in series have been observed in late February, but early season displays were generally in shorter series.

During the early breeding season, the wattles of the cock diminished rapidly to their resting condition after each series of displays was completed. The nature of the wattles has been studied intensively by Regnier (1927) who found them to be secondary sexual

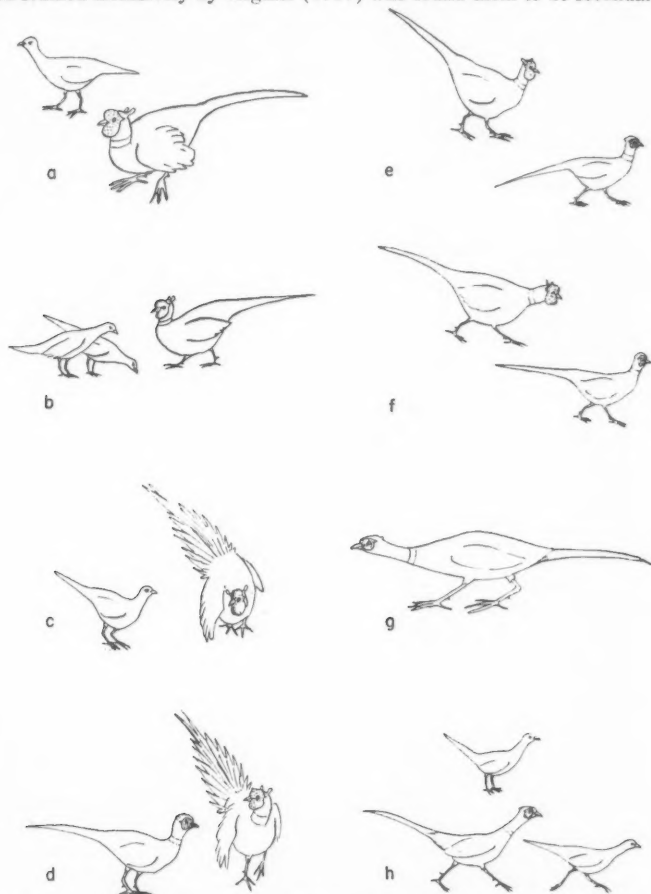


Fig. 22. a. Predisplay run of cock in courtship; b. predisplay run of cock upon re-entering his territory; c. courtship display of cock to the hen; d. intimidation display of dominant cock to submissive cock; e. walking pursuit of dominant cock toward submissive cock; f. running pursuit of territorial cock toward intruding cock; g. pose of non-territorial cock while trespassing upon a territory; h. non-territorial cock chasing hen, illustrating lack of pre-display run.

characters developing suddenly with the onset of spermatogenesis. Wodzicki (1931) describes the arrangements of blood vessels which provide the mechanism of their erection.

Leffingwell (1928:11), in a description of the display which otherwise agrees substantially with that given above, says, "Apparently the air sacs are partly inflated, for

after the pose is held for several seconds the plumage is allowed to fall back in its natural position as the bird gives out a hissing sound." The hissing sound has also been described by Kozłowa (1947:424) who further states that it is accompanied "by a low clapping, brought forth by the vibration of the tail feathers, which sounds like the flutter of a large sail in the winds." Neither of these sounds was heard by me, possibly because of imperfect hearing in the higher ranges.

Not all cocks displayed during the early breeding season; those that did display seemed to limit their attentions to certain hens. These particular hens exhibited some postures of which I can find no published description. These consisted of the following: a half-squat, of extremely short duration, as if the hens' "knees" had buckled momentarily; a flirting hop, like that of a tethered hawk, consisting of a short horizontal jump, made with the wings slightly opened and both feet off the ground; and a stretch, in which the wings were opened and raised while the hen rose up on her toes and stretched her neck. None of these poses was oriented strictly toward the male although all took place near a male (fig. 25). The presence of one or all these patterns in the action of a hen, along with a nervous, jerky manner of walking and occasionally a definite depression of the tail seemed to stimulate courtship display by the cock. Since these actions in the hen were relatively inconspicuous, the frequency and duration of their occurrence through the two seasons as shown in figure 21 may be inaccurate.

Antagonistic behavior.—Antagonistic actions between cocks consisted of bluffing, sparring and intimidation display. In a bluffing contest, two cocks of approximate equality in dominance stood facing one another or stalking along parallel to one another with heads held high. A few seconds after the start of the contest their neck hackles rose, their wattles swelled and they emitted a hoarse *krrrrah*, a pose and call of which I can find no published description. One of the contestants then generally gave way, but if this did not happen a sparring contest sometimes ensued. Fragmentary observations in dense cover indicated that the same growling call might be used as a warning by a dominant cock against an inferior.

In a sparring contest, the two antagonists crouched beak to beak, or walked on parallel courses, heads low, one occasionally pecking at the other. At intervals one or both would spring into the air like gamecocks. This behavior is very conspicuous and so the ratio of observation to occurrence should be high. It is significant, then, that sparring during the early breeding season was very rare. This is contrary to the findings of Wight who said (1930:223) that "Actual fighting apparently occurs only early in the season before or at the time of mating."

The intimidation display, which was made by one cock to another, was similar to the courtship display of the cock to a hen. There were, however, differences between the two displays. The intimidation display was not as complete, the wing being but partly spread and the lateral display of the plumage not as extreme. In addition, the cock giving the intimidation display almost never strutted, but displayed from one position, following the other cock, if he should run a few steps, with the same head-down, rump-up run that precedes display to the hen. Lastly, the head of the displaying cock was held high during the intimidation display (fig. 22d) whereas it was held low during the courtship display (fig. 22c).

While I have found no previous description of this behavior in the pheasant, intimidation displays which resemble courtship displays have been observed in many birds, including the Ruffed Grouse (*Bonasa umbellus*) (Allen, 1934; Bump, *et al.*, 1947).

The intimidation display was commonly given only once, although occasionally several were given in succession. In complete form it was preceded by the predisplay run described above and followed by the walking pursuit (fig. 22e), in which the pursuing

cock, feathers fluffed and wattles full, stalked along slowly after the other, who avoided him. As seen in figure 21, where these three postures are grouped as "intimidation behavior," they were more common after mid-March than during the period of first breeding behavior (mid-February to mid-March). Antagonism between hens was manifested in much the same way that it was among cocks (see p. 171).

As a result of the growing antagonism between cocks during this period, the cock flocks were almost all reduced to groups of two by mid-March (fig. 21). As early as late February (fig. 21), a few lone cocks had established a daily route covering essentially the same ground that would form the territory in April. They did not, however, defend it as this time.

Crowing.—Crowing, being the song of the pheasant, partakes both of courtship and antagonistic behavior. In this area, crowing has first occurred in past years anywhere from early January to early March (Leopold, 1947:86). In 1948, the first crow was heard on February 18; thereafter, crowing was generally infrequent until mid-March, but it was heard every morning when more than an hour's observation was made.

Summary of events of the early breeding season.—1. During a transition period which extended from late January through early February, testis growth was just beginning, the *tucket* call was characteristically heard, there was a concentration of birds in one part of the marsh and cock flocks appeared on the marsh edge.

2. During the early breeding season, which extended from mid-February to mid-March, there was courtship display by cocks to hens and antagonistic behavior between cocks. Crowing began and the first lone cocks were seen during this period, near the end of which the cock flocks had been reduced to groups of two.

SPRING DISPERSAL PERIOD

During this period, from mid-March through April, the average testis size increased rapidly and reached its peak. Courtship behavior, both of cocks and hens, now became more general (fig. 21).

Antagonism between cocks.—Baskett describes the breakup of cock flocks as follows (1947:6): "In early spring, the males become progressively less companionable and by March immediate proximity of two usually results in strife." Such was not found to be true in the present study. Dominant cocks were generally separated from each other by the end of February, but submissive cocks continued to associate with dominant cocks in some degree until mid-April. These associations were in pairs after mid-March. Beginning about mid-March, the tension between the members of a pair of cocks rose, especially in the dominant member, and was expressed by increasingly frequent intimidation displays and walking pursuits directed at the submissive member (figs. 22e and 22f). The wattles of the dominant cocks were swollen most of the time and their body feathers were held out, giving the impression of bulk. The wattles of the submissive cocks swelled only when they displayed to hens or to other cocks of low dominance, both of which they occasionally did during this period; their body feathers were generally held flat.

The last cock pairs broke up in mid-April. Thereafter the dominant cocks endeavored to keep all other cocks away from their territories; the submissive cocks generally remained in the same general area but did not defend territories.

Crowing.—Crowing intensity (measured in crows per minute for the highest hour) rose rapidly through March, reaching a first peak in early April. This rise could have been due to one of two causes: (1) increase in the number of crowing cocks; (2) a rise in the crowing intensity of individual cocks. While both of these occurred, the effect of the first is believed to have been greater.

Individual cocks continued to push out of the marsh into the uplands through March, but by late March only a few were established in the uplands. About the first of April, however, as the new growth of vegetation increased, the spring dispersal became general. This is shown graphically in figure 21, through the rapid drop in crowing intensity to mid-April. Since the crowing counts were taken in the marsh, cocks moving

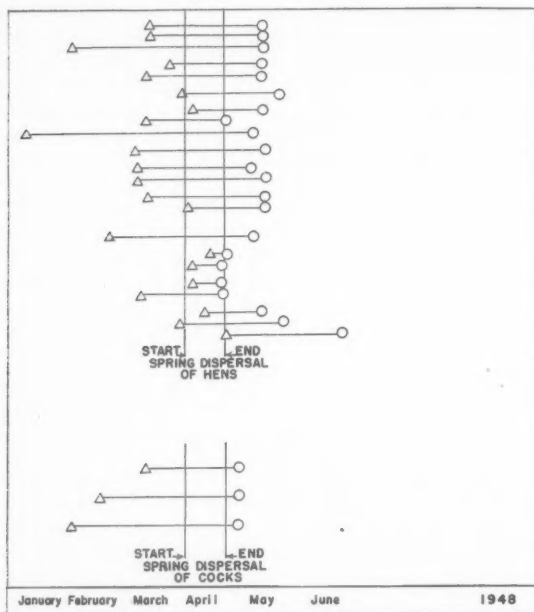


Fig. 23. Records of individual birds before and after spring dispersal. Triangles mark last observation in marsh; circles, first in upland. Vertical lines mark principal period of dispersal.

to the uplands beyond earshot were not counted. There are, of course, other possible explanations of this sudden drop. Some cocks may have stopped crowing; this is possible, but is considered unlikely. Cocks in general might crow at a lower intensity, but where individual birds were followed this did not occur.

In addition to this negative evidence, there is positive evidence of an exodus of crowing cocks from the marsh. Figure 23 shows the last dates on which three marked cocks were seen in and around the marsh and the first date of subsequent observation in the uplands. The data for hens are more complete. Twenty-two hens were seen both in the marsh and, later, in the uplands in this period. Additional evidence of the departure of hens from the marsh during early April, 1948, is presented in figure 24. Here the frequency of hen observations around a mid-marsh observation post is shown to have dropped off sharply from the end of March to mid-April. The coincidence in time of this drop with that of crowing intensity (fig. 21) is striking.

To sum up this evidence, there appeared to be a dispersal of both cocks and hens

from the marsh during March and April of 1948, with most of the movement starting in the first two weeks of April.

Similar spring dispersal periods have been reported in other studies. Randall (1940: 304), writing of Pennsylvania, states that a spring movement from winter cover occurred during late March and early April. Baskett (1947:7) mentions a movement away from winter cover concurrent with the breaking up of winter bands of pheasants in Iowa, and states that "... as dispersal progresses, males begin crowing." This is contrary to the evidence of the present study, which indicates that crowing began before much dispersal had taken place. A more detailed study of spring dispersal has been made in South Dakota (Janson, 1947). There a ten-mile movement from winter to summer range

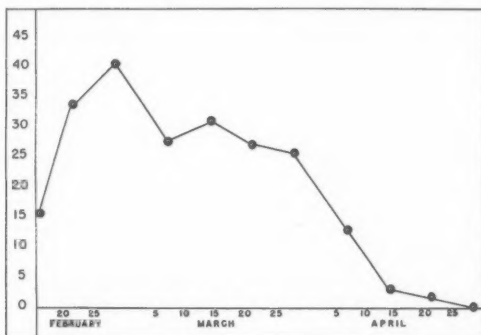


Fig. 24. Number of marked hens seen about a mid-marsh feeding station in 1948. February peak reflects period of large-scale marking.

was traced by means of crowing intensity samples. This dispersal began in late March.

Because the density of the vegetation hinders observation, it is not practicable to measure directly the proportion of the cock population leaving the immediate vicinity of the marsh during this dispersal period. Such a measurement might, however, be achieved indirectly. The rise in crowing intensity of the "normal" cock as the season progresses could be determined from an average of individual counts and this curve magnified until its peak coincided with the second peak in the seasonal crowing curve (fig. 21). The difference, then, between the hypothetical curve and the first peak in the seasonal crowing curve should give an approximation of the proportion of cocks moving beyond earshot.

Distribution of birds in the uplands.—During May and June, 1948, 26 hens, which had been marked the previous winter in the "hatchery" marsh, were found in the surrounding uplands; most of them were within one-quarter of a mile of the marsh. Another was found, dead, six miles away in the center of the city of Madison; it had been run over but how it reached that spot was not ascertained. Since there is no question as to the origin of these hens, a spring dispersal, up to one and a half miles is demonstrated. Most of these hens were observed in harems in early May but three were killed during mowing in late June or shortly before.

Summary of events of spring dispersal period.—1. Antagonism between cocks resulted in the dissolution of cock pairs in early April.

2. A spring dispersal period in March and April was indicated by sight records; the principal period of dispersal was shown to be late March and early April by mid-marsh crowing intensity counts and by sight frequency records.

3. The greatest observed radius of spring dispersal of hens was one and a half miles.

4. Cocks showed a rapid gonad weight increase through the whole period.

PERIOD OF COURTSHIP AND MATING

In the spring dispersal some birds went no farther than the marsh edge. These marsh edge birds were studied intensively and the subsequent accounts are based on them. The period of courtship and mating started in April and continued through June.

Period of territory establishment.—Territories were established during the first half of April. The increasing tension between pairs of cocks that culminated in the complete breakup of cock flocks has already been described. This disappearance of cock pairs, although complete by mid-April, was accomplished largely in early April; the final rupture between pairs was characterized by the change in the dominant member from a display pose (figs. 22d and 22e) to a chasing pose (fig. 22f). The appearance and duration of the chasing pose are shown in figure 21, as "defense of territory by male."

As soon as a given cock had begun consistently to chase off any other cock, he was considered to have a territory. Although territories were first defended during the first two weeks of April, the actual daily ranges of individual dominant cocks along the marsh edge did not change essentially from February through June. Not all cocks established territories; those not doing so were usually of low rank in the dominance order.

Crowing.—Despite the drop of total crowing intensity due to spring dispersal, the crowing frequency of individual cocks continued to rise during the first half of April.

Courtship.—The first half of April was the period of greatest courtship display activity. Not only the territorial cocks but also some nonterritorial cocks displayed. This was possible in the case of the latter because the hens were not so closely oriented toward territorial cocks as they were in the succeeding period, tending to wander somewhat more within their habitual range. Thus they often foraged beyond the orbits of the territorial cocks and the nonterritorial cocks could then court them with impunity.

In the typical courtship of the early breeding season (mid-February to mid-March) the hen being courted ran, after each display, in such a way that in the course of a series of displays the cock and the hen often covered a considerable distance (30 to 150 yards) in a straight line. In early April, however, this type of movement on the part of the hen was gradually replaced by one in which, while still eluding the cock, she remained in a circumscribed area.

Formation of the harem nucleus.—Like the cocks, hens in general used one area habitually every day through the early breeding season (mid-March). Subsequently, a number of hens dispersed from the marsh. Certain hens, however, did not change their daily range appreciably and these formed the nucleus of the marsh-edge harems. In one particular cornfield, which was a well used feeding area during the early breeding season, the membership of these early-April harem-nuclei was studied in both years. After the period of spring dispersal, it was found that the majority of hens remaining were two years old or more. In two harems studied intensively, one in each year, the total number of hens remaining after spring dispersal, or joining the harems later, was 18. Of these, 12, or 66 per cent, were old birds. In the area as a whole the percentage of old hens was considered to be about 20 per cent as determined by winter trapping records, corroborated by sight records. Thus the concentration of old hens in this particular cornfield was probably higher than that at any other spot; the old hens remained near their winter range while younger birds dispersed to the uplands.

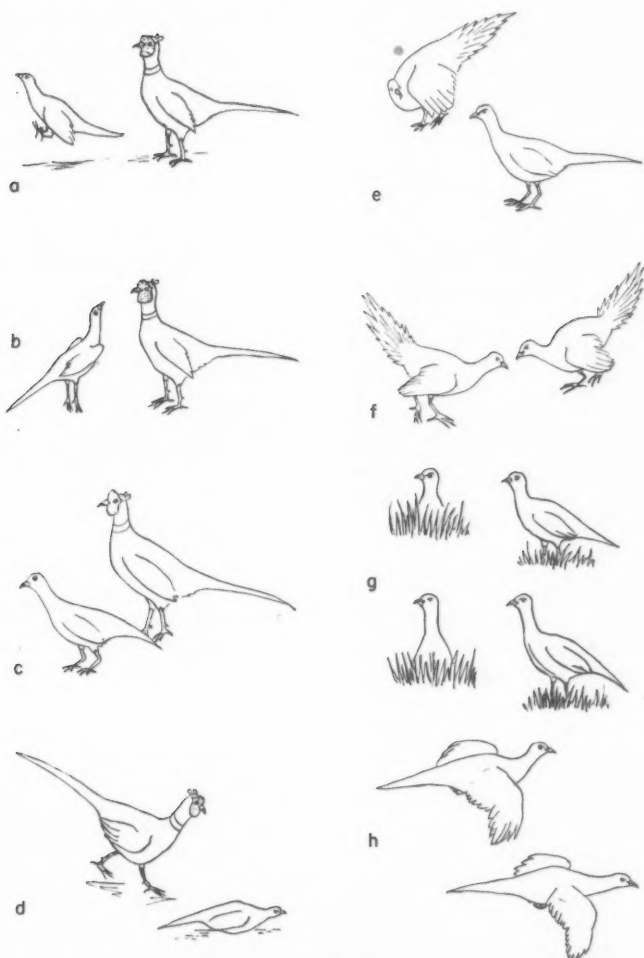


Fig. 25. a. Courtship display of hen, the flirting hop; b. courtship display of hen, the stretch; c. courtship display of hen, the half-squat; d. precopulatory behavior, type 3, the hen squats; e. the intimidation display directed by one hen toward another hen; f. two hens fighting; g. upper, posture of a hen without chicks, neck not stretched; g. lower, posture of hen with chicks, neck stretched; h. upper, posture in flight of hen with chicks, head held high; h. lower, posture of a hen without chicks, head held in line with body.

Mating period.—Late April and early May was found to be the period of peak testis weight (fig. 21). The hens which remained at the marsh edge during the spring dispersal period became more closely associated with territorial cocks in late April; that is, harems were formed. These harems were joined by new hens during late April and May. A harem count on any particular day in this period was often lower than the known harem membership; presumably this was due to the fact that the missing hen or hens, while nearby, were masked by vegetation. Because of this and because, as shown later, harems gain some hens while others are leaving to incubate, a harem count on any particular day gives a value which is probably lower than the number of hens which are actually members of the harem. Early May, however, was considered as the time in which the greatest percentage of hens were in harems in both years of study.

After early May, courtship was found to be of a different sort than previously. Display of the cock to members of his harem grouped around him in the feeding period was

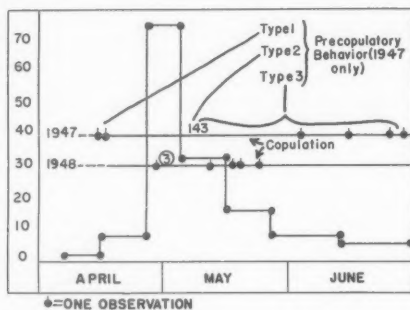


Fig. 26. Date of first egg in successful nests of 1947 (derived from Kozlik) plotted with observations of copulation (figures on horizontal lines indicate numbers of observations when more than one).

rare, but very often if one hen emerged from cover on to the feeding grounds later than the others, the cock ran to her and gave a series of displays in rapid succession. This, taken in conjunction with the fact that during the period of territory establishment (early April) a hen which was being displayed to could always terminate the cock's attentions by joining a group of other hens, suggests that a single hen was a greater stimulus to courtship than a group of hens.

From mid-April on, nonterritorial cocks did not court hens; although attracted by hens, they were driven off by the territorial cocks. Even on those rare occasions when they came near hens, they did not display, but simply chased them (fig. 22h).

Copulation was seen for the first time each year in the latter half of April, 14 being recorded in 1947 and eight in 1948 (see fig. 21). The curve for the date of laying of the first successful egg in 1947 (derived from Kozlik, 1947:51-76) is presented in figure 26; a repetition of the copulation records has been included in this figure to facilitate comparison. In 1947 the first copulations were noted shortly after the first successful eggs were laid, but the bulk of copulations were seen when the "average" hen had just finished her clutch (Kozlik, 1947:51-76). Whether this discrepancy represents a true phenological difference between the marsh edge, where most of the mountings were observed, and the uplands, where most of the brood-counts were made, or whether it was due to a sampling error, is not known.

Three distinct types of precopulatory behavior were observed. The earliest of these consisted of a series of rapidly repeated displays by the cock, followed by the squatting of the hen, whereupon the cock mounted. In the second type, the cock pursued the hen, seized her by the feathers at the back of the neck and mounted. In such an instance the hen sometimes struggled and on one occasion was apparently lifted clear off the ground for an instant. The only time a nonterritorial cock was seen to copulate with a hen was preceded by precopulatory behavior of this type. The third type consisted simply of the hen squatting and the cock mounting (fig. 25d). In 1947, two cases of the first type only were observed in late April; six of the second type only were seen in the third week of May; and seven of the third type only were seen from late May to late June, mostly in late May (fig. 26).

The existence of territories.—There seems to be a general agreement (Leffingwell, 1928; Wight, MS; Randall, 1940; Baskett, 1947) that the pheasant is territorial. Baskett, however, expressed an opinion common among students of pheasants when he stated (1947:8) that "... there probably was a tendency toward the establishment of crowing areas or territories by the male pheasants, but that these territories were very plastic and subject to frequent readjustments probably even through the nesting phase." The findings of the present study support this opinion insofar as the plasticity of territorial boundaries is concerned.

The size and shape of a territory were sometimes modified by environmental changes, the extension of the daily cruising radius of the hen, and pressure from adjacent territorial cocks. In order to define the limits of each territory, I plotted each observation of a given cock on a large-scale map; the resulting outline, in conjunction with data on cover, adjacent territories and the movement of hens, aided in analyzing territorial requirements.

Figure 27 shows the changes in boundaries of several adjacent territories from mid-April to the end of May in 1947. The ground cover was classified as (1) that affording concealment to a crouching pheasant (over six inches) and (2) that of lesser height. Examples from figures 27 and 28 illustrate cases where the three modifying factors mentioned above were operative.

The importance of open ground for courtship.—Relatively open ground, where the cock and hens may see one another and where trespassing cocks may be more readily seen, played an important part in the function of the harem. The bulk of sexual activity took place during the morning and evening feeding periods, and these periods were spent on, or at the edge of, relatively open ground. Over 25 cocks' territories which were partly or completely known included some open ground by late April. In figure 27 the extension of the territory of cock III toward the north, with the result that his territory continued to include some open ground, may be observed. Such cases were common.

Kozłowa (1947:423), discussing the habitat of the related form, *Phasianus colchicus bianchii*, in its native Tadjikistan, describes several types of interspersed open and brushy cover, as well as a park-like area, as being typically inhabited by the birds. From this it would appear that in the area of her study, as well as that of mine, the daily range of a breeding cock contained open ground. Wight (1933) maintained that on southern Michigan farmland, territories could be made most desirable for pheasants by protecting the area from cutting, burning and grazing and by replanting where necessary. His intention was to furnish (*op. cit.*:7) "... good winter roosting cover, which will continue to stand into the spring and prevent the hens from scattering before the breeding season." There is no indication that he considered openings of any importance.

Contrary to Wight (in McAtee, 1945:146) I found no evidence that a patch of brush

or woods is an essential part of the territory. Some heavy herbaceous vegetation was always present where brush or woods were absent.

The effect of the cruising range of the hen on territorial boundaries of males.—Generally, the cock followed the hens out from cover and then, when the feeding period

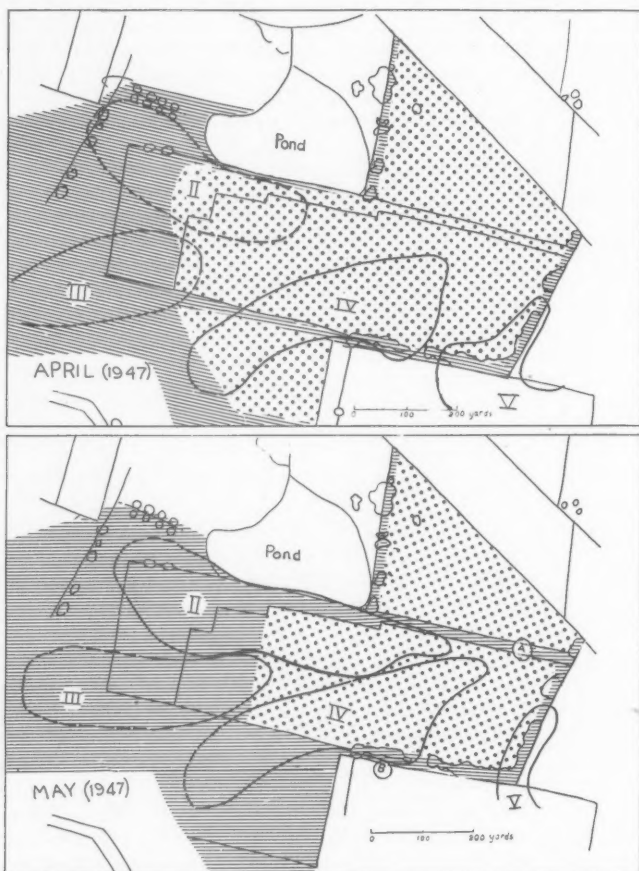


Fig. 27. Territorial boundaries of males in April and May, 1947. Solid lines, exact boundaries; broken lines, approximate boundaries. Stippled areas, vegetation under six inches in height; lined areas, vegetation over six inches. Encircled letters mark nest sites.

was over, led the way back. He seemed to be more strongly oriented roostward than they. However, since he was also strongly attracted to the hens, he followed them until stopped by some obstacle, like another cock's territorial boundary. An example of the way in which this tendency on the part of the cock to follow the hens could modify territorial boundaries is given below; in this case the movement of the hen was toward her nest.

The difference in shape of territory IV between April and May consisted largely of an addition of a fingerlike projection (fig. 27) toward the northwest in May. In May an incomplete nest, believed to belong to one of the hens of harem IV, was found just beyond the point of this finger (symbol A). Although the individual hens were at that

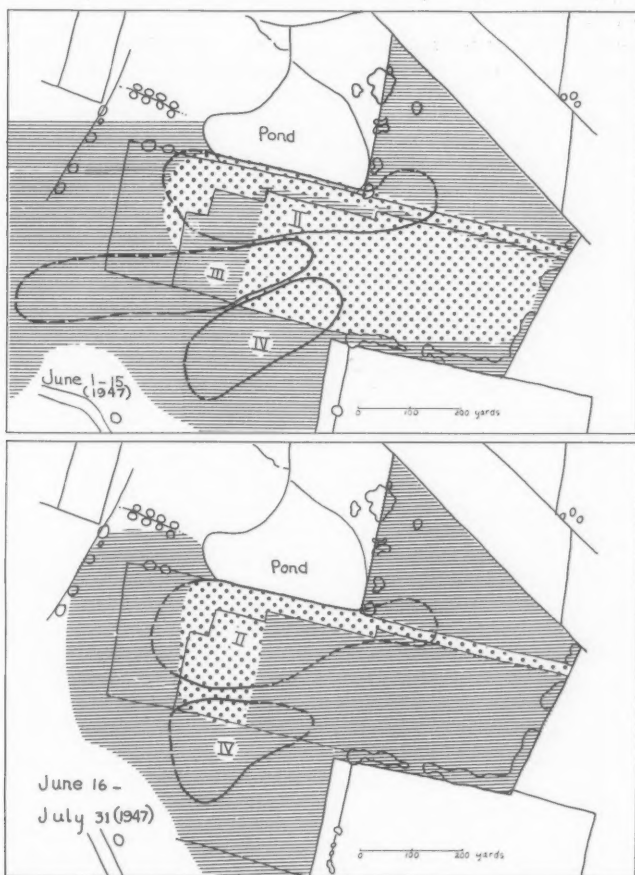


Fig. 28. Territorial boundaries of males in June and July, 1947. Symbols as in figure 27.

time too imperfectly marked for certain identification, it seemed that one hen led the harem in this direction during the feeding period while the cock followed the harem. This particular nest was watched and was soon deserted, whereupon the movements of the harem toward this location were greatly reduced.

A second similar instance was observed in May. The nest (B, fig. 27) was completed and incubation began about the middle of May; the part of territory IV which had extended to the immediate proximity of the nest was no longer used by the cock after

incubation began (fig. 28), presumably because that particular hen did not associate to any extent with the rest of the harem while incubating.

Baskett, however, believes (1947:10) that "... nest sites were probably defended by males." The findings of the present study, while based on limited evidence, are more in agreement with Wight, who states (1933:7) "The nests are usually situated within or near the crowing area."

The effect of adjacent territorial cocks on territory boundaries.—Wherever territorial boundaries are shown running close together in open ground in figures 27 and 28, fights between adjacent cocks were fairly frequent. The principal cause seemed to be the tendency of hens to wander over boundaries and of cocks to follow them. These fights sometimes took on a pendulum pattern in that the intruding cock slowly retreated, when attacked, into his own territory; there he rallied and, in turn, gradually drove back his attacker. After a few jumps in which the antagonists met breast to breast in the air, the conflict took the form of a beak-to-beak crouch, with a sparring of heads, varied with parallel stalking of the cocks. Eventually they drifted apart; no definite "winner" could be determined. Even more commonly, however, the intruding cock, whether territorial or nonterritorial, simply retreated when attacked by the territorial cock, who abandoned the chase near his boundary.

It has been pointed out in this study that the male, in running toward another bird to display, uses the predisplay pose, with head low and in, and rump up. After mid-April, when dominant cocks replaced the intimidation display to other cocks with the chasing pose, this predisplay run was directed only at hens. Generally, but not always, such a run ended in a courtship display. It was interesting to note that when a territorial cock left his territory, whether because of chasing off a trespasser or because he had been flushed by some animal, he returned to the territory in a predisplay pose (fig. 22b). It seemed as if, in the words of Tinbergen (1936:7), "a territory is, to the male, a 'potential female'."

Territory size.—Foote (1942:51) described five territories which he considered to vary in size from 30 to 112 acres, whereas Gould (1939:7) found the range in size of five other territories to be from 30 to 50 acres. The density of pheasant population in neither case is clear. Twining (1946:146), in an area thought by me to be of high pheasant density (estimated at one bird per two acres), found 11 territories to range in size from 3 to 13 acres. In the present study, a single territory (IV, figs. 27 and 28) was found to vary from 12 or 13 acres in April and May to six acres by mid-June. Twelve other territories in this area were 6-12 acres in size. Territory size is probably modified principally by population pressure and factors limiting vision, that is, cover and topography.

Nonterritorial cocks.—Wight (in McAtee, 1945:146) states that, "if a male is entirely vanquished in his quest for an area, he usually moves out completely, and becomes a wanderer . . ." This is not supported by the findings of the present study. Individual nonterritorial cocks were occasionally found to wander as far as half a mile, but generally were almost as localized as territorial cocks during the breeding season. Their range was somewhat larger than the average territory, however; several nonterritorial cocks were observed to have daily ranges of about 80 acres. The range of a nonterritorial cock frequently included areas within the territories of territorial cocks. These were entered both in the course of foraging and when attracted by the hens of the harem. Generally a trespassing nonterritorial cock was driven from the territory, but often the territorial cock did not see him or, if he saw him, was engaged otherwise at the moment. A striking example of this latter situation was observed on May 18, 1947. Two territorial cocks were fighting at their mutual boundary line in an open field while two hens stood nearby.

A nonterritorial cock entered the field and began to chase one of the hens; she ran in a circle around the fighting cocks, while he pursued. Within 30 yards of the two territorial cocks he seized her by the neck feathers and mounted. Neither of the fighting cocks gave any indication of having noticed this performance.

The pose of nonterritorial cocks was generally furtive while trespassing (fig. 22g). However, they persisted in returning time after time only to be chased directly off again by the territorial cock. When the territorial cock was elsewhere, they often fed at his accustomed spot unmolested. Incidents of this sort are probably the basis of Baskett's (1947:8) statement: "Throughout spring, there were numerous cases in which a field which the observer had come to regard as the domain of a particular male was traversed by another male without apparent strife resulting."

I found nonterritorial cocks to have several characteristics: (1) they were never seen to crow; (2) their wattles were always small unless they were actually in close contact with hens (a rare event); (3) they did not cluck; (4) they did not fight; (5) they did not court (display to) hens after mid-April.

The fact that these nonterritorial cocks were continually attracted to the harems raises the question of the extent to which a hen away from the harem is subject to harassment by them. On several occasions they were observed to pursue hens which were apparently on their way to the nest. When a hen was with a harem, she was protected from this form of attention, but when she left it she was liable to pursuit. The actual effect of such a surplus of males upon the reproductive success of the hen population was not determined in this study. Two authors, however, have given descriptions of the effects of a heavy excess of cocks. Beebe (1931:47) says that under certain conditions "cocks may become so numerous in a locality as to interfere seriously with the breeding. They disturb the hens while sitting on the eggs and often acquire the egg-eating habit, if they do not, indeed, actually kill the young birds." Einarsen also writes (1945:5): "It is very probable that territorial competition among the birds adversely affected reproduction. Cock birds have been seen persistently molesting hens and chicks."

During the season of 1948, a tally was kept of all territorial and nonterritorial cocks on the study area. The results were: territorial, 18; nonterritorial, 8; doubtful, 3. The proportion of nonterritorial cocks in the thinner populations of the uplands seemed to be lower than that at the marsh edge.

Since a direct count of nonterritorial males is seldom feasible, an indirect method was devised wherein the proportion of nonterritorial cocks was estimated from the sex ratio and the average harem size. A series of observations of harem size made by R. A. Ellis was used. Fifty-four harems were counted on and near the University of Wisconsin Arboretum in April, 1946; the average number of hens per harem was 1.8, both in the marsh edge and in the uplands. The sex ratio of the population, determined through the drive-census of the previous winter, was 70 cocks per 100 hens. Before proceeding with the simple calculations necessary to determine the proportion of unsuccessful breeders, we must list the four assumptions upon which the validity of the result will rest: (1) both sexes were flushed proportionately during the drive census; (2) no important differential mortality occurred during late winter and early spring; (3) no important differential ingress or egress occurred through April; (4) the harem spotter was successful in seeing all hens of every harem. No information invalidating the method on any of the first three assumptions has been found, but it may safely be assumed that the observer will discover something less than 100 per cent of the hens in the harems he spots.

The winter census of 1946 showed a total of 152 hens in the Arboretum marsh. Dividing this number by 1.8, the average harem size in April, we get 85, the number of harems which might be formed from such a population. Dividing this by the number

of cocks tallied in the winter census, 106, we get 0.80. According to this computation, then, 80 per cent of the Arboretum cocks were successful breeders. However, since we know the average harem size to be something higher than 1.8, the percentage of successful cocks must be something lower than 80.

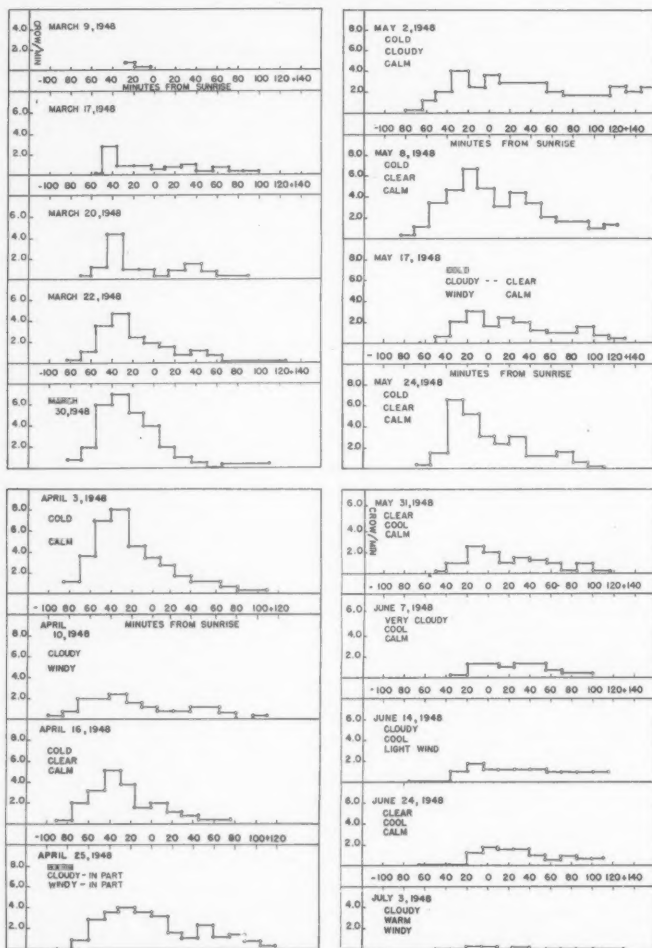


Fig. 29. Records of crowing intensity for individual mornings expressed in crows per minute. All crows within earshot were recorded. The weather on each of the March mornings represented here was clear, cool and calm.

Excess cocks in a hunted pheasant population represent an unharvested surplus. The above method of measuring this particular excess, while crude, indicates that in this case it is substantial and therefore of potential importance in management.

Antagonism between hens.—Concurrent with harem formation (late April and early May) were fighting between hens and display of one hen to another. Both of these were presumably expressions of antagonism. In a hen fight, both hens spread the tail, lowered the wings and forepart of the body and rushed at one another (fig. 25f). When close together, they sometimes jumped against each other, with the head up, but generally one gave ground and retreated after a single dash together.

The intimidation display of the hen was very much like that of the cock; the head was held low, the rump raised, the tail spread and canted toward the object of the display, the wing on that side somewhat spread and the contour feathers ruffled (fig. 25e). The display was often repeated several times, like the display of the cock. The hen which was displayed to acted much the same in either case, dashing alertly away for a few steps and then stopping while the displaying bird came up and displayed once more. The occurrence of these two types of behavior is given in figure 21. Whether antagonism between hens in these or other forms might be a factor limiting harem size is not known. However, it is a possible instrument for such limitation.

Crowing.—In late April and early May, crowing rose to a second peak which coincided with that of testis weight (fig. 21). Individual crowing counts indicated that this rise was due to a general increase in the crowing intensity of individual cocks, a continuation of the rise which had begun in March.

Crows audible from a mid-marsh observation post during the morning period were recorded on many days; these records are expressed in terms of crowing intensity (crows per minute) in figure 29. As may be seen, cloudy or windy weather resulted in a flattening of the morning curve as well as an extension to the right. On cold, clear, calm mornings, on the other hand, the peak or peaks of the curve were much more pronounced. The seasonal development of curves of such mornings is traced below.

The typical crowing curve of late March and early April was found to be single peaked, the peak occurring about 40 minutes before sunrise (fig. 29). After mid-April, a second peak in the morning curve began to develop due to the crowing of territorial cocks upon entering the feeding grounds; this second, and smaller, peak was found about half an hour after sunrise. Following the feeding period there was a third and still smaller peak of crowing which occurred as the birds were leaving the feeding grounds, about 125 minutes after sunrise. These prefeeding and postfeeding peaks became more pronounced in May (fig. 29). As the season advanced, the first morning peak became gradually later until by the end of May it occurred at about ten minutes before sunrise. It is interesting to note that in the Wild Turkey (*Meleagris gallopavo silvestris*), which also "sings" on the roost during the breeding season, there is a similar increasing lateness of this singing as the season progresses (A. S. Leopold, verbal communication).

The morning crowing intensity curve has been used as an aid in establishing the time that crowing counts should be taken as an index to pheasant populations (Kimball, 1949). Kimball (p. 107) says: "Fortunately crowing intensity between -40 to +50 [minutes from sunrise] is relatively constant, the maximum variation being ± 7.5 per cent of average," and considers this period suitable for counts.

My findings were in agreement with this statement only with respect to cloudy, windy days. On clear, calm days the drop in crowing intensity after the presunrise peak was very sharp. This indicates that under the conditions of this study a crowing "census" taken before sunrise on a clear, calm day could not be compared directly with one taken after sunrise on the same day without a considerable error.

Weather and daily routine.—It is difficult to assess the influence of weather on daily routine since weather includes so many variables; however, my findings are in only partial agreement with those of Baskett, who says (1947:7): "During intemperate

weather, all diurnal activities are often altered" The morning routine in late March, April and May was found to conform to a rather definite pattern; this pattern was most closely adhered to on clear, calm days but was by no means abandoned when it was cloudy, windy or even raining. This pattern was found to be about as follows: the birds left the roost about sunrise and moved to the feeding grounds, sometimes flying. My impression was that they flew only on mornings of heavy dew, but data on that specific point were not gathered. The feeding period began about 35 minutes after sunrise; the early part of the feeding period was spent in walking slowly out from cover and the end of the period in returning to cover, while the middle part was devoted to feeding and loafing. It has been seen in a previous section that crowing intensity was higher at the beginning and the end than during the middle of the period.

Summary of period of courtship and mating.—During this period (late April and May), (1) territories are established; (2) harems are formed; (3) copulation takes place; (4) the first eggs are laid; (5) crowing reaches a second peak and starts diminishing.

THE LATE BREEDING SEASON

Crowing.—Crowing intensity dropped in late May, June and July, the curve following closely that for gonad weight for the same period (fig. 21).

Incubation.—During this period, the harems continued to decline in size as more and more hens left them to incubate. Baskett (1947:7) states that hens "probably are solitary only while incubating; even then they may consort with other females and a male during rest periods." I found no evidence that incubating hens joined the harems to feed. Solitary hens exhibiting a skulking posture were occasionally seen apart from the harems at this time; these may have been birds which had left the incubated nest to feed alone.

The increase in trespassing.—As the harems diminished in size in late May and June, some cocks found themselves with only one hen or none at all. If there was only one hen, she often led the cock into a neighboring territory. Without demonstrable proof, I suspected that the gregariousness of the hen might have attracted her to some adjacent harem. Whatever the reason, if a single hen strayed from a harem of five, for example, the cock remained with the four which did not stray, but if a cock had but one hen, his tendency was to follow her; and single hens appeared to wander farther afield than hens in groups. Each trespass of a cock on his neighbor's territory resulted in a defense by the resident cock, providing the intruder was detected.

The end of territorial behavior.—When his last hen is gone, the cock seems to lose his territorial proclivities very rapidly. In figure 28 it may be seen that the territory of cock III, who lost his last hen about the middle of June, was soon deserted by him; the ground was then added to the territories of his neighbors who still had hens. Note also how cock IV modified his territorial boundary to include open ground (in this case a closely grazed pasture). Pressure from cock IV possibly speeded the relinquishment of territory by cock III.

A few observations suggested that between the time of losing his last hen and the relinquishment of territory a cock might for a time be attracted to the hens of an adjacent cock, trespassing on neighbors' territories in consequence. Also there was evidence of a transitional period near the end of territoriality, comparable to that near its beginning, when trespassers were subjected to a walking pursuit (fig. 22e) rather than a chase (fig. 22f).

Cocks which had abandoned territories seemed to stay in much the same area they had occupied when behaving territorially; frequently they were seen near hens and chicks, but there was no definite association comparable to that of the harem.

On the other hand, if a cock had abandoned a territory, he might be stimulated to resume part, at least, of his sexual activities. In 1947, I observed one cock which, by the end of June, had apparently become nonterritorial (he had maintained a territory earlier that season). A hen appeared near him one day and went through her sexual antics. He responded with a partial swelling of the wattles and an imperfect display. During July and August I observed these same two birds frequently and was able to observe signs of increasing sexual excitement in the cock. His wattles, which at the end of June had swollen only partially when the hen performed, swelled to their fullest extent when she danced by him in late July. Similarly his display became more complete over the same period. In August this cock was still displaying occasionally to the same hen and showed signs of antagonism toward other cocks even though his molt had progressed in the meantime so far that all his old tail feathers had been lost and the new ones were about four inches long. It seemed to me that this was a case of sexual recrudescence based on stimulation by the hen. All that is known of the hen is that she was at least two years of age.

Brood observations.—In 1947, whereas a few broods were brought off in May, the bulk of the successful hatch occurred in June. In July and August I made many brood observations; while the bulk of the findings will be reported elsewhere (Collias and Taber, MS), certain aspects of behavior are reported here.

A limited number of observations indicated that hens with chicks up to at least five weeks of age could be distinguished from hens without chicks by their frequent assumption of a craning posture (fig. 25g). In addition, hens with small chicks, when flushed, were observed to hold their heads higher in flight than hens without chicks (fig. 25h). The potential value of these revealing postures in surveys of percentage of reproductive success among hens seems to warrant verification of these findings.

Although complete records were not kept, it was my impression that chicks of six weeks and above generally followed the daily routine of the adult birds, feeding half an hour to an hour after sunrise and retiring to cover. Younger chicks, however, seemed to appear later, perhaps an hour after sunrise and remained active for a longer period. Possibly this difference in time of appearance was correlated with food habits, the insects upon which the young chicks fed not being active at the earlier hour. Another possibility is the avoidance of early morning dew by a hen with a young brood. If this difference in routine were true, the accuracy of brood counts would be affected.

Summary of late breeding season.—During this period (June, July and August), (1) crowing ends; (2) territories are relinquished; (3) the peak of the hatch occurs.

GENERAL SUMMARY

The first courtship behavior was detected in February, when cocks began to cluck and to display to hens, which also displayed. Clucking by dominant cocks continued throughout the season. Courtship displays by cocks became increasingly numerous through the first half of April; thereafter they declined in number. At the same time, the area covered by a series of courtship displays changed from a linear to a circular form. After mid-April, courtship display by the cock was largely directed toward single hens appearing late on the feeding grounds.

Copulation was first seen in mid-April and continued through May and June, being seen most often in May. It was preceded by three types of precopulatory behavior, each type occupying a definite part of the total seasonal period of copulation. Nonterritorial cocks displayed to hens until mid-April, when harems were formed, but simply chased them thereafter.

Antagonistic behavior between cocks began in February, when cocks of approxi-

mately equal dominance began to have bluffing contests and to spar occasionally. Cock flocks were reduced to groups of two by mid-March. Of these groups of two, the dominant member then intimidated the submissive member by means of the predisplay run, the intimidation display and the walking pursuit. By the first of April, some cocks were defending territories by actively chasing trespassers and by mid-April all cocks which were going to defend territories had begun to do so. A residue of nonterritorial cocks remained. Toward the end of June, when territoriality was waning, there was a change in attitude on the part of a territorial cock toward trespassers from an active chase to a walking pursuit.

Antagonistic behavior between hens, as manifested by fighting and the rendering of the intimidation display, occurred largely in late April and May.

Crowing began in February and continued at a low level until early March, when crowing intensity in a marsh area began to build up rapidly. The first peak of total crowing intensity came in early April; there was a subsequent decline to mid-April, indicative of the spring dispersal of some crowing cocks to the uplands. A second peak came in late April and early May; this was thought to represent the true peak of crowing of individual cocks. Crowing declined rapidly thereafter and was at a very low level by mid-July.

The daily curve of all crowing in the marsh came to a peak about 40 minutes before sunrise and declined rapidly thereafter in late March and early April, but after mid-April a second, smaller peak appeared about 35 minutes after sunrise; a third, still smaller peak about 90 minutes after sunrise was also sometimes noted. These two secondary peaks represented the increase in crowing intensity of each territorial cock when entering and leaving the feeding area.

Nonterritorial cocks were not observed to crow.

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Department of Wildlife Management, University of Wisconsin, Madison, Wisconsin, May 15, 1949.

ALTERNATE CARE OF TWO NESTS IN THE BLACK-CHINNED HUMMINGBIRD

By HOWARD L. COGSWELL

The report by Nickell (Wilson Bull., 60, 1948:242) of a Ruby-throated Hummingbird (*Archilochus colubris*) taking alternate care of two nests, one with eggs and the other with young, recalls to mind similar activity which I observed on the part of two females of the Black-chinned Hummingbird (*Archilochus alexandri*) in 1943.

The area where these observations were made was one of suburban homes and gardens in Pasadena, Los Angeles County, California, at the edge of the mesa oak-grassland association at an altitude of 670 feet on the alluvial fan about two miles from the base of the San Gabriel Mountains. A 60 by 100-foot lot, on which our home was located, had two medium-sized mesa oaks (*Quercus engelmannii*) on it, as did the lot next to the west and the two lots next to the east (see fig. 30). Flowers grown about the houses on all four lots were visited by either or both of the nesting female hummingbirds observed. Although it was not determined precisely where the defended boundary, if any, lay between the territories of the two females, it seemed that the sphere of activity of one of them was from our lot westward and of the other from our lot eastward. These two females are referred to subsequently as W and E, respectively, and their various nests and broods by the same letters followed by numbers.

Identification of both W and E as distinct from the Anna Hummingbird (*Calypte anna*) was made by close observation of plumage and size differences, and as distinct from both the Anna and the Costa Hummingbird (*Calypte costae*) by the type of nests built. All nests of the Black-chinned Hummingbirds were composed only of plant down and spider web and lacked the external decoration with bits of lichen or dried leaves which seems to be characteristic of the two California species of *Calypte*. Anna Hummingbirds are scarce in summer in the area studied, and I recorded Costas no closer than the foothills two miles away.

In 1943 the first male Black-chinned Hummingbird was seen near this area on April 2, and nuptial flights were noted occasionally from then until at least May 20. Females were in the general area by late April, but were not definitely identified in the immediate vicinity of our yard until May 5, when the first nest was located. No male Black-chins were seen in our yard or those of our neighbors at any time during the subsequent nesting period, although one was seen in the oak area of northwestern Arcadia about one-fourth mile east of our house on May 31 and June 16.

The first nest (W1), discovered on May 5 by watching W go to it, was in a small avocado tree (see fig. 30). Incubation was apparently in progress. On May 28 the nest held small young. This brood probably came off successfully, although the young were not seen or heard in the vicinity afterward as would be expected. At any rate, also on June 6, our neighbors at 3801 reported a newly occupied hummingbird nest (W2) in vines on their front porch about 40 feet from the location of W1. I examined W2 on several subsequent dates and found it to be a typical Black-chin's nest and presumed that it was built by W since the female occupying it fed over the same area.

On July 7, W was feeding young in W2 and alternately building a new nest (W3) in the oak over the fence between 3801 and 3807. She performed building, foraging and feeding of young intermittently and in irregular sequence. The two young in W2 flew on July 14 according to an occupant at 3801, and on July 16 I found W incubating two eggs in W3. Two young birds (presumably those from W2) were in the oak tree above

W3 giving the high squeaky food call and being fed by W during irregular periods off of the nest. This process went on until at least July 27 or 28, some 13 or 14 days after the young had left the nest.

The eggs in W3 hatched about July 29 or 30 and the young were seen being fed until they left the nest on August 19 and 20 (one each day), after about 20 to 22 days in the nest. The one smaller young sat on the dilapidated nest all night on the 19th. Once when the female came to feed them, she went first to the one in the tree above the nest as it squeaked loudly, fed it for about 15 seconds and then came slowly down to the nest and fed the young on the edge. As she approached, the latter gave only one short squeak and dropped feces at the same time. Young hummingbirds, probably the same ones, were still heard occasionally at the end of August and once on September 11.

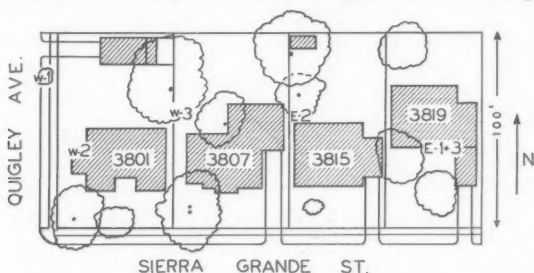


Fig. 30. Map of four suburban lots in Pasadena with locations of nests of Black-chinned Hummingbirds.

On May 28, the same date that W had young in her nest W1, the first nest was found in the other territory which I have designated as E's. It was on a slender stem of an ivy growing over the front door and under the canopy of a narrow porch at 3819. This nest (E1) held one well-grown young and another was in the tree nearby, both of them being fed by E according to occupants at 3819. The second young bird flew on May 31.

On June 6, the same date as the discovery of the change from nest W1 to W2 on the part of W, still another Black-chin's nest, newly constructed, was found among the leaves of a low branch of an oak in the rear of 3815. This nest (E2) was later found to have been most likely constructed by E at about the time her first brood was taking wing. Incubation was begun about June 7 or 8 in E2. Then, for several days, about June 10 to 12, E was feeding at least one young in the tree top and intermittently incubating the new clutch of eggs in E2. Several times I saw her leave the nest, feed about the flowers in the yard and then, without having been out of my sight, fly up into the other oak about 20 feet away and proceed to regurgitate food into the young hummingbird which was sitting there. After this she returned to incubate the eggs in E2 either with or without again feeding at the flowers. This process was repeated many times. The periods on the nest, as noted in the course of scattered observations from June 10 to 12, were about 2 minutes in duration and those off the nest somewhat shorter. No further feeding of the young bird in the tree was noticed after June 12, this being some 13 days after the last young one had left nest E1.

The assumption that nests E1 and E2 were actually constructed by the same female is admittedly based on circumstantial evidence, as indeed is likewise the case regarding W1 and W2. Evidence additional to the mere timing and location within the same territory of the successive nests was afforded by the actions of E. While feeding the young in the trees near nest E2 she foraged over the same flower beds in the front yard of 3819

as she had while feeding the young in E1 on May 28. She also frequented the same perching spot on the same wire along the east boundary of lot 3819. Further, and still circumstantial, evidence is provided by the events which followed.

Incubation continued at E2 after the disappearance of the young from the trees overhead. The eggs in E2 apparently hatched about June 21 or 22. E was seen feeding two small young (then several days old) in nest E2 on June 26. Then on June 28 or 29 the occupant at 3819 noted a female hummingbird back at nest E1 in vines over the doorway; and on July 2 this bird had laid two eggs and was incubating! On this date, not seeing any activity around nest E2, the occupant at 3815 investigated and found the two young dead. We deduced that the female had deserted, although for what reason and whether before or after the death of the young is unknown. The one resuming operations at nest E1 (now E3) was undoubtedly the same individual, as she used the same perches for bill wiping and fed in the same area as when she was feeding young in this nest from May 28 to 31. Two young later left the third nest successfully.

Other observations of alternate nest care by female Black-chinned Hummingbirds in the foothills at Monrovia, California, are reported by J. J. Parsons (News from the Bird Banders, 9, 1934:45; 10, 1935:3-4, 10). One female was observed to care for two broods at once, her own first brood out of the nest and a younger foster brood placed in the same nest by the observer, and also to incubate eggs in another nest during the same period. Although the eggs of the later nest did not hatch in the first instance of such "triple-brood" care, they did in a similar instance in July, 1935 (Parsons, *op. cit.*).

Still another instance of a female hummingbird (presumably *Archilochus alexandri*) incubating eggs in one nest and feeding young in another is described in a newspaper article accompanied by a photograph in the Los Angeles Times of June 5, 1945. The factual content of that article was confirmed in a letter from Mr. Howard Rath, Jr., San Marino, California, sent to Dr. F. A. Pitelka. Mr. Rath states, in addition, that the two nests were located three feet apart in an oak tree and that only one of the two eggs in the second nest hatched.

In Pasadena in 1943 one of the hummingbirds observed was seen actually building the later nest in one instance (W3) during the last week her previous brood was in the nest. Building apparently took place at about this time in the other instances I observed also, with the laying and beginning of the incubation of the eggs in the new nests taking place 2 to 7 days after the earlier brood flew (except for the deserted nest E2). Timing of the overlapped nestings reported by Parsons corresponds closely with this schedule except for the foster young interposed by him.

The desertion of the Pasadena brood E2 by E could be supposed to have been due to a new series of stimuli bringing about responses of egg-laying and incubation before the young in E2 were ready to fly. However, in the report on *Archilochus colubris* by Nickell (*loc. cit.*) the overlap in timing of the two nests was about as great as in this case (E2 to E3), but desertion did not occur. Neither did desertion take place in the case reported by Rath nor in the two instances reported by Parsons where foster young were fed in one nest and eggs incubated during the same period in another. The distance between nests E2 and E3 was about 75 feet, far greater than in the other instances cited, and it may have been a factor leading to the desertion.

It is apparent, then, that alternate care of two nests with young in one and eggs in the other, or of young out of an earlier nest plus incubation of eggs in a later nest, may occur fairly frequently in the Black-chinned Hummingbird and that the timing of such overlapped nestings varies. If the overlap is great, the survival of both broods involved is apparently jeopardized by the redoubled activity necessary on the part of the female parent, but some of these nestings at least are successful.

Museum of Vertebrate Zoology, Berkeley, California, February 18, 1949.

BIRD NOTES FROM NEVADA

By IRA N. GABRIELSON

For some time prior to the appearance of the "Birds of Nevada" by J. M. Linsdale (Pac. Coast Avif. No. 23, 1936), I had been collecting specimens and notes on Nevadan birds when opportunity afforded. I was, therefore, much interested in this publication and proceeded to check my records against it. Reference was also made to Alcorn's list from the Lahonton Valley, Churchill County (Condor, 48, 1946:129-138). Those of my notes and specimens that provide new records of locality or seasonal occurrence would seem to be of interest, and a summary of them is presented here.

My work during the years that I visited the state most frequently required me to visit field stations and field personnel of the Fish and Wildlife Service. The opportunity to observe and collect birds came sporadically and usually for short periods only. Available time rather than locality or season governed the taking of such specimens as were obtained. In addition to such sporadic collecting, sight records were regularly made while I was in the state. All specimens listed are in my collection, which is at the Patuxent Research Refuge at Laurel, Maryland.

Between 1926 and 1948, I made irregular trips into the state, the majority being between 1931 and 1935. My visits occurred as follows: October 23 and 24, 1926; September 5 to 10, 1931; May 24 to June 3, and October 6 to 12, 1932; August 10 to 26, 1933; April 25 to 28, September 16 and 17, and November 3 and 4, and 16 to 23, 1934; July 24, 1936; September 12 to 14, 1938; June 18 and 19, 1939; September 25 and 26, and September 29 and 30, 1939; May 30 and June 1, 1948.

Gavia immer. Common Loon. A single fall record, October 8, 1932, Walker Lake, Mineral County.

Colymbus nigricollis. Eared Grebe. Common on Walker Lake, Mineral County, October 7 and 8, 1932; male taken on the latter date. Six birds were counted on small ponds in the Virgin Valley on the Charles Sheldon Wildlife Refuge, Humboldt County, on May 30 and 31, 1948.

Aechmophorus occidentalis. Western Grebe. Common on Walker Lake, Mineral County, October 8, 1932; six or more present in the Virgin Valley, Charles Sheldon Wildlife Refuge, Humboldt County, on May 30 and 31, 1948.

Podilymbus podiceps. Pied-billed Grebe. Two found at Ruby Lakes Refuge, Elko County, June 1, 1948.

Pelecanus erythrorhynchos. White Pelican. Five present on Walker Lake, Mineral County, October 7, 1932; a single bird seen in northern Eureka County on the Humboldt River, June 1, 1948.

Phalacrocorax auritus. Double-crested Cormorant. A single bird flew over the Colorado River near Searchlight, Clark County, November 19, 1934.

Casmerodius albus. Egret. Several seen near Overton in Muddy Creek, Clark County, September 30, 1939. A single bird noted at Quinn River Crossing, Humboldt County, May 31, 1948.

Leucophoyx thula. Snowy Egret. Two present on Virgin Creek (Charles Sheldon Refuge), Humboldt County, May 31, 1948; common at Ruby Lake National Wildlife Refuge, Elko County, June 1, 1948.

Botaurus lentiginosus. American Bittern. One noted near Lamoille, Elko County, May 30, 1932, and two at Ruby Lakes Refuge, Elko County, June 1, 1948.

Mycteria americana. Wood Ibis. Several present near Overton on Muddy Creek, Clark County, September 30, 1939.

Plegadis mexicana. White-faced Glossy Ibis. On August 15, 1933, a number seen in Railroad Valley, in northeast Nye County, where they were feeding with other water birds in the overflow from an artesian well.

Cygnus columbianus. Whistling Swan. Seven individuals, Walker Lake, Mineral County, November 16, 1934.

Branta canadensis. Canada Goose. Many hundreds on Winnemucca Lake, Washoe County, September 7, 1931; two large flocks, October 8, 1932, at Walker Lake, Mineral County. Several broods about one-third grown observed on Virgin Creek, Charles Sheldon Refuge, Humboldt County, May 30 and 31, 1948.

Chen hyperborea. Snow Geese. Ten present on Washoe Lake, Washoe County, November 16, 1934.

Anas platyrhynchos. Mallard. On August 15, 1933, saw several broods of Mallards in Railroad Valley, Nye County; two broods of small birds in the Virgin Valley (Charles Sheldon Refuge), Humboldt County, May 30 and 31, 1948.

Anas strepera. Gadwall. About eight pairs noted in small ponds in Virgin Valley (Charles Sheldon Refuge), Humboldt County, May 30, 1948.

Anas acuta. Pintail. New locality records for this species are as follows: October 8, 1932, a single bird at Walker Lake, Mineral County; September 7, 1931, many tens of thousands on Winnemucca Lake in Washoe County; October 15, 1933, very common in Railroad Valley, Nye County; October 19, 1933, eight birds north of Tuscarora, Elko County; fifty on a little pond at head of Humboldt River, Elko County, August 20, 1933; six pairs and a number of drakes in Virgin Valley (Charles Sheldon Refuge), Humboldt County, on May 30, 1948; and two birds at Ruby Lake, Elko County, on June 1, 1948.

Anas carolinensis. Green-winged Teal. Present on October 10 and 11, 1932, Pine Creek Ranch in northern Nye County; six on a tiny pond at Twin Springs, southern Nye County, November 17, 1934; a single bird on the Humboldt River in Elko County, October 20, 1933.

Anas cyanoptera. Cinnamon Teal. The following are new locality records: May 31, 1932, two males and one female in a little pond north of Tuscarora, Elko County; October 8, 1932, several in Fish Lake Valley, Esmeralda County; August 15, 1933, many hundreds of both young and old birds in Railroad Valley, Nye County; October 20, 1933, about a dozen on the head of the Humboldt River, Elko County; common in Virgin Valley (Charles Sheldon Refuge), Humboldt County, May 30 and 31, 1948; and numerous on Ruby Lake Refuge, Elko County, June 1, 1948.

Spatula clypeata. Shoveller. Two birds in the Virgin Valley (Charles Sheldon Refuge), Humboldt County, May 30, 1948.

Aythya americana. Redhead. Two birds in Virgin Valley (Charles Sheldon Refuge), Humboldt County, May 30, 1948; two on Ruby Lakes Refuge and more than fifty on a small reservoir near Jiggs, on west side of Ruby Mountains, both in Elko County, June 1, 1948.

Bucephala albeola. Buffle-head. A single bird at Twin Springs, Nye County, November 17, 1934.

Oxyura jamaicensis rubida. Ruddy Duck. Common at Walker Lake, Mineral County, on October 7 and 8, 1932, when a male was taken, and on November 16, 1934; six males and two females in Virgin Valley (Charles Sheldon Refuge), Humboldt County, May 30, 1948.

Mergus merganser. American Merganser. Six on Walker Lake, Mineral County, October 8, 1932.

Cathartes aura. Turkey Vulture. About a dozen at Lamoille, May 30, 1932, a single bird near Mountain City, June 1, 1932, two near Elko, May 31, 1948, and two at Ruby Lakes, June 1, 1948, all in Elko County; common, Minden, Douglas County, August 12, 1933; about a dozen in Paradise Valley, Humboldt County, August 20, 1933.

Accipiter gentilis. Goshawk. A single bird seen May 27, 1932, on Lehman Creek in the vicinity of Snake Mountains, White Pine County.

Accipiter striatus. Sharp-shinned Hawk. One in Fish Lake Valley, Esmeralda County, October 8, 1932, and one found dead, October 11, 1932, at Potts Post Office in northern Nye County.

Accipiter cooperii. Cooper Hawk. Single individuals noted on each of the following days: August 16, 1933, Baker Creek, White Pine County; November 19, 1934, near Nelson, Clark County; November 20, in the Virgin Valley in Clark County; and Harrison Pass, Ruby Mountains, Elko County, June 1, 1948.

Buteo jamaicensis. Red-tailed Hawk. Several on May 30, 1932, near Lamoille, Elko County, and one in Virgin Valley, Clark County, November 20, 1934. On August 19, 1933, in the vicinity of Tuscarora and on the head of the Owyhee River, Elko County, I noted a concentration of about forty or fifty Red-tailed Hawks including one very dark-colored individual. Four seen in Harrison Pass, Ruby Mountains, Elko County, June 1, 1948.

Buteo swainsoni. Swainson Hawk. I flushed a bird from a nest near Mountain City, Elko County, on June 1, 1932; on August 19, 1933, a female was taken from a number concentrated near the head

of the Owyhee River, Elko County; two nests ready for eggs, April 28, 1934, and four birds seen, May 30, 1948, in northern Washoe County (Charles Sheldon Refuge).

Buteo lagopus. Common Rough-legged Hawk. Two individuals, October 10, 1932, Pine Creek Ranch, Nye County.

Buteo regalis. Ferruginous Rough-legged Hawk. On August 18, 1933, in the Ruby Mountains just west and north of the present Ruby Lakes Refuge I saw two birds.

Aquila chrysaetos. Golden Eagle. September 5, 1931, Charles Sheldon Refuge, Washoe County; two in Ruby Valley, August 17 and 18, 1933, one near Wells, May 29, 1932, and one near Elko, May 31, 1948, Elko County; two near Tonahap, October 9, 1932, and two on the Pine Creek Ranch, October 10, 1932, Nye County; several near Reno, Washoe County, October 11, 1932; November 19, 1934, one near Nelson and another in the Virgin Valley, both in Clark County.

Circus cyaneus. Marsh Hawk. September 5, 1931, and May 30, 1948, Charles Sheldon Refuge, Washoe County; May 31, 1948, two near Winnemucca, Humboldt County; May 31, 1933, near Mountain City and Ruby Lakes, June 1, 1948, Elko County; October 7, 1933, near Yerington, Lyon County; October 8 and 9, 1932, Fish Lake Valley, Esmeralda County; October 10, 1933, a number at both the Pine Creek Ranch and near Potts Post Office in Nye County; August 19, 1933, several north of Tuscarora and on the Little Humboldt River, and August 20, 1933, a single bird along the Little Humboldt, all in Elko County.

Falco mexicanus. Prairie Falcon. Additional locality records: Austin, Lander County, May 26, 1932; Ely, White Pine County, May 28, 1932; Wells, May 29, 1932, and Lamoille, May 30, 1932, both in Elko County; one at Pine Creek Ranch, Nye County, October 10, 1932; and one on Charles Sheldon Refuge, Washoe County, May 30, 1948.

Falco sparverius. Sparrow Hawk. New locality records include the Charles Sheldon Refuge in northern Washoe County, September 5, 1931; Tuscarora, May 30 and 31, 1948, and head of the Humboldt River, August 19-20, 1933, Elko County; one at Minden, Mineral County, August 12, 1933; Ely, May 28, 1932; and Wheeler Peak, August 16, 1933 (male taken); White Pine County; Virgin Valley, Clark County, November 20, 1934.

Dendragapus fuliginosus sierrae. Sooty Grouse. A single bird was collected at Tahoe Meadows, Washoe County, August 11, 1933.

Centrocercus urophasianus. Sage Hen. Several between Ely and Lemon Creek, White Pine County, May 27, 1932; a flock of one hundred, and one of twenty-eight near Potts Post Office, Nye County, October 11, 1932. There were numerous Sage Hens on the Charles Sheldon Refuge, Washoe County, September 7, 1931, August 25, 1933, and September 25, 1939. A single hen just south of Quinn River Crossing, Humboldt County, May 31, 1948. Six birds on Ruby Lake Refuge, Elko County, June 1, 1948.

Lophortyx californica californica. California Quail. Male and female collected near Minden, Douglas County, November 4, 1934.

Lophortyx gambelii gambelii. Gambel Quail. Five specimens taken near Nelson, Clark County, November 19, 1934. Many seen in Virgin Valley the following day and again near Overton, September 30, 1939.

Grus canadensis. Sandhill Crane. On June 18, 1939, I saw numerous Sandhill Cranes, including three pairs with downy young, and on June 1, 1948, I counted twenty adults and two very small young following one pair, at Ruby Lake, Elko County.

Rallus limicola. Virginia Rail. One noted in Virgin Creek Valley on Charles Sheldon Refuge, Humboldt County, May 31, 1948.

Fulica americana. American Coot. Common on Walker Lake, Mineral County, October 7 and 8, 1932; about fifty individuals at Twin Springs, Nye County, November 17, 1934; common in Virgin Valley (Charles Sheldon Refuge), Humboldt County, May 30 and 31, 1948.

Charadrius vociferus. Killdeer. One taken August 8, 1933, near Fernley, Washoe County; a brood of newly hatched young was found on Virgin Creek, Charles Sheldon Refuge, Humboldt County, May 30, 1948.

Capella gallinago. Wilson Snipe. Two near Lamoille, May 30, 1932, and two at the head of the Humboldt River, Elko County, August 20, 1933.

Actitis macularia. Spotted Sandpiper. One near Austin, Lander County, May 26, 1932; Virgin Creek, Charles Sheldon Refuge, Humboldt County, May 30, 1948; and Ruby Lakes, Elko County, June 1, 1948.

Catoptrophorus semipalmatus. Willet. Two noted at Ruby Lakes Refuge and one on a small pond near Jiggs, Elko County, June 1, 1948.

Limnodromus griseus scolopaceus. Long-billed Dowitcher. There was a flock of approximately 1000 birds on a shallow pond in the Carson Sink, Churchill County, on August 11, 1933. The four birds collected and checked by F. A. Pitelka belong to this form. They are all first-year birds which have undergone only a partial prenuptial molt and presumably represent non-breeding individuals.

Himantopus mexicanus. Black-necked Stilt. Six or more birds, obviously nesting, noted on Virgin Creek, Charles Sheldon Refuge, Humboldt County, May 30 and 31, 1948.

Larus californicus. California Gull. September 7, 1931, exceedingly abundant on Winnamucca Lake, Washoe County; October 7 and 8, 1932, common on Walker Lake, Mineral County; and August 12, 1933, a few on the Nevada shore of Lake Tahoe, Washoe County.

Zenaidura macroura. Mourning Dove. Lamoille, Elko County, May 30, 1932; male taken in Paradise Valley, Humboldt County, August 20, 1933; Carson Sink, Churchill County, August 11, 1933; Austin, Lander County, May 26, 1932; about a dozen on the Pine Creek Ranch, Nye County, October 10, 1932.

Bubo virginianus. Horned Owl. One chased crickets in front of car headlights as I watched deer coming in to drink on the Charles Sheldon Refuge, Washoe County, September 4, 1931. A female taken in Fish Lake Valley, Esmeralda County, on October 8, 1937, presumably represents *B. v. occidentalis*; also noted on Willow Creek near Potts Post Office, Nye County, October 11, 1932, near Ely, White Pine County, August 13, 1933, and at Mountain City, Elko County, June 1, 1932. A female taken on the Pine Creek Ranch near Potts Post Office, Nye County, on October 9, 1932, is identical with birds of the race *B. v. lagophonus* from northeastern Oregon and southeastern Washington.

Speotyto cunicularia hypugaea. Burrowing Owl. Near Minden, Douglas County, August 12, 1933; Virgin Valley, Clark County (female taken), November 20, 1934.

Asio otus wilsonianus. Long-eared Owl. Two males taken at the Pine Creek Ranch, Nye County, October 10, 1932, and one seen on Virgin River, Clark County, November 20, 1934.

Asio flammeus. Short-eared Owl. A single individual noted in Ruby Valley, Elko County, August 17, 1933; one at the head of Owyhee River, Elko County, August 19, 1933.

Chordeiles minor hesperis. Booming Nighthawk. Specimens taken at Wheeler Peak, White Pine County, August 16, 1933, and Tuscarora, Elko County, August 19, 1933. Noted commonly at Minden, Douglas County, August 12, 1933, and Lamoille, Elko County, August 18, 1933.

Aëroautes saxatalis. White-throated Swift. About a dozen coursing over the meadows at head of Humboldt River, Elko County, August 19, 1933, and approximately half that many about the old Duferine ranch house and Thousand Springs Creek Canyon on Charles Sheldon Refuge, Humboldt County, May 30 and 31, 1948.

Selasphorus platycercus platycercus. Broad-tailed Hummingbird. One collected at Wheeler Peak, White Pine County, August 16, 1933, and one at Tahoe Meadows, Washoe County, August 12, 1933.

Selasphorus rufus. Rufous Hummingbird. One collected on Wheeler Peak, White Pine County, August 16, 1933.

Stellula calliope. Calliope Hummingbird. Noted on Mount Rose, Washoe County, August 12, 1933; several at Tuscarora, Elko County, June 1, 1932.

Colaptes cafer. Red-shafted Flicker. Charles Sheldon Refuge, Washoe County, four on May 30, 1948; Tuscarora, June 1, 1932, and Lamoille, August 18, 1933, Elko County.

Asyndesmus lewis. Lewis Woodpecker. Two seen near Lamoille, Elko County, May 30, 1932; five in Harrison Pass, Ruby Mountains, June 1, 1948; and a single bird near Franklin Lake on the same date, Elko County.

Sphyrapicus thyroideus. Williamson Sapsucker. A single bird at Potts Post Office, Nye County, October 10, 1932.

Dendrocopos villosus orius. Hairy Woodpecker. A male collected near Eastgate, Lander County, October 14, 1933.

Tyrannus verticalis. Arkansas Kingbird. Lamoille, Elko County, May 30, 1932; Carson Sink, Churchill County, August 11, 1933; several at Ely, White Pine County, August 16, 1933; a female taken at Secret Pass, Elko County, August 18, 1933; usually numerous near Lamoille and at head of Humboldt River, Elko County, on August 18, 19, and 20, 1933. I have a nearly pure albino taken on August 14, 1933, near Fallon, Churchill County.

Sayornis saya. Say Phoebe. Walker Lake, Mineral County, October 7, 1932; several at Nelson, November 19, 1934, two in the Valley of Fire and a male taken at St. Thomas on November 20, 1934, all in Clark County; two at head of Humboldt River, Elko County, August 20, 1933; and a pair nesting on a cliff near Ely, White Pine County, May 28, 1932.

Empidonax traillii. Traill Flycatcher. Two at Tuscarora, Elko County, June 1, 1932.

Empidonax wrightii. Wright Flycatcher. One taken on August 22, 1933, on Pine Nut Mountain, Douglas County.

Empidonax griseus. Gray Flycatcher. One collected on August 18, 1933, in Secret Pass, Elko County.

Contopus richardsonii. Western Wood Pewee. One noted at Lamoille, Elko County, May 30, 1932.

Eremophila alpestris. Horned Lark. Horned larks are the most common passerine bird in much of Nevada. I have the following skins of the race *E. a. lamprochroa*: two males and one female, Las Vegas, Clark County, November 20, 1934, and one male, Carson Sink, Churchill County, August 11, 1933. The following specimens represent *E. a. utahensis*: a male, Fish Lake Valley, Esmeralda County, a male twenty miles north of Tonapah and a male south of Belmont, both in Nye County, all taken on October 9, 1932; a male at Twin Springs, Nye County, November 17, 1934; two males, Snake Valley, White Pine County, November 18, 1934; and a male and a female near Caliente, Lincoln County, November 18, 1934.

Tachycineta thalassina. Violet-green Swallow. Common at Tuscarora, June 1, 1932; abundant on the head of the Owyhee and Humboldt rivers, August 19 and 20, 1933, Elko County.

Riparia riparia. Bank Swallow. Two in a mixed flock of swallows on head of Humboldt River, Elko County, August 20, 1933.

Stelgidopteryx ruficollis. Rough-winged Swallow. Noted near Austin, Lander County, May 26, 1932; common at Carson Sink, Churchill County, August 11, 1933; fairly common at head of Humboldt River, Elko County, August 19, 1933; ten or more in Virgin Valley, Humboldt County, May 31, 1948.

Hirundo rustica. Barn Swallow. Several, Lake Tahoe, Washoe County, August 12, 1933; several, Virgin Valley, Charles Sheldon Refuge, Humboldt County, May 30, 1948; near Austin, Lander County, May 26, 1932; common near Wells, May 29, 1932, at Lamoille and Star Valley, May 30, 1932, and at head of Humboldt River, August 19 and 20, all in Elko County.

Petrochelidon pyrrhonota. Cliff Swallow. Common on Charles Sheldon Refuge, May 30 and 31, 1948, and Paradise Valley, August 19 and 20, 1933, Humboldt County; noted also at Wells and Lamoille, May 30, 1932 (two large nesting colonies at ranch buildings), at Tuscarora, June 1, 1933, and at Jiggs, June 1, 1948 (a large nesting colony), and at Humboldt and the head of the Owyhee River, August 19 and 20, 1933, all in Elko County.

Cyanocitta stelleri. Steller Jay. A specimen of the race *frontalis* was taken at Tahoe Meadows, Washoe County, August 12, 1933; a male taken on August 16 and a female taken on August 17, 1933, both at Wheeler Peak, White Pine County, represent the race *macrolopha*.

Aphelocoma coerulescens nevadae. Scrub Jay. Pine Nut Mountain, Douglas County, August 22, 1933; near the top of Silver Peak, Esmeralda County, where a male and female were taken on November 22, 1934; several, Potts Post Office, Nye County, October 11, 1932; several on the lower slopes of Wheeler Peak, White Pine County, August 16, 1933; two on the eastern slope of Ruby Mountains, Elko County, August 18, 1933.

Corvus corax. Raven. Charles Sheldon Refuge, Washoe County, May 30, 1948; Austin, Lander County, May 26, 1932; Ely, White Pine County, May 28, 1932; Star Valley and Lamoille, May 30, 1932, Tuscarora, May 31, 1932, Ruby Mountains, August 16, 1933, heads of both the Owyhee and Little Humboldt rivers on August 19 and 20, 1933, all in Elko County; three near Overton, Clark County, November 20, 1934; two, Walker Lake, Mineral County, October 7, 1932; two, Pine Creek Ranch, northeastern Nye County, October 10 and 11, 1932.

Corvus brachyrhynchos. American Crow. Austin, Lander County, May 26, 1932; newly fledged young near Wells, May 30, 1932, common near Lamoille, August 18, 1933, and a flight of several hundred birds at dusk on the head of the Humboldt River, August 19, 1933, all in Elko County; a group of about 500 feeding on buffalo berries in Paradise Valley, Humboldt County, August 20, 1933; two on the Charles Sheldon Refuge, Washoe County, May 30, 1948.

Gymnorhinus cyanocephalus. Piñon Jay. Seen near Potts Post Office, Nye County, October 11, 1933; numerous on Wheeler Peak, White Pine County, August 16, 1933; very common, Pine Nut Mountain, Douglas County, August 22, 1933. On November 22, 1934, on Silver Peak, Esmeralda County, I saw the largest flock of piñon jays in my experience. Several thousand birds were spread over a large area in a loose aggregation of flocks that filled the piñon pines for some distance. Two males and a female were taken from this group.

Nucifraga columbiana. Clark Nutcracker. Two at Tahoe Meadows, Washoe County, August 12, 1933; one near Eastgate, Churchill County, August 14, 1933.

Parus gambeli inyoensis. Mountain Chickadee. Specimens collected at Pine Creek Ranch, Nye County, October 10, 1932, at Eastgate, Churchill County, August 14, 1933, and at Silver Peak, Esmeralda County, November 22, 1934; seen on Pine Nut Mountain, Douglas County, August 22, 1933.

Parus inornatus. Plain Titmouse. Pine Nut Mountain, Douglas County, August 22, 1933.

Auriparus flaviceps acaciaram. Verdin. One collected at St. Thomas, Clark County, November 20, 1934.

Sitta carolinensis tenuissima. White-breasted Nuthatch. One collected at Tahoe Meadows, Washoe County, August 12, 1933; also noted near Potts Post Office, Nye County, October 10, 1932.

Troglodytes aëdon parkmanii. House Wren. Common, Tuscarora, Elko County, June 1, 1932; several seen and one taken on Baker Creek, Wheeler Peak, White Pine County, August 17, 1933; one taken at Secret Pass, Elko County, August 18, 1933; and one seen, Ruby Lakes Refuge, Elko County, June 1, 1948.

Thryomanes bewickii eremophilus. Bewick Wren. Taken at Nelson, Clark County, November 19, 1934.

Telmatodytes palustris plesius. Long-billed Marsh Wren. A male taken at Minden, Douglas County, November 4, 1933; several noted, Virgin Valley, Charles Sheldon Refuge, Humboldt County, May 30 and 31, 1948.

Catherpes mexicanus. Canyon Wren. Noted near Ely, White Pine County, May 28, 1932; Wells, May 29, 1932, and on the Little Humboldt River, Elko County, August 20, 1933; Thousand Springs canyon, Humboldt County, May 31, 1948.

Salpinctes obsoletus obsoletus. Rock Wren. Noted in Elko County at Wells, May 29, 1932, Star Valley, May 30, 1932, Tuscarora, June 1, 1932, and at head of Humboldt River, August 20, 1933; seen at Austin, Lander County, May 26, 1932; at Walker Lake, Mineral County, October 8, 1932; at Searchlight and Nelson, November 19, 1934, on which date one was collected, in the Valley of Fire, November 20, 1934, all in Clark County. One male taken at Walker Lake, Mineral County, November 18, 1934.

Oreoscoptes montanus. Sage Thrasher. Noted at Wells and Lamoille, May 30, 1932, and at heads of the Humboldt and Owyhee rivers, August 19 and 20, 1933, all in Elko County; Charles Sheldon Refuge, Washoe County, September 5, 1931; near Ely, White Pine County, August 16, 1933; Paradise Valley, Humboldt County, August 20, 1933.

Turdus migratorius. Robin. Wells and Lamoille, May 30, 1932, Tuscarora, June 1, 1932, and Ruby Mountains and Lamoille on August 18, 1933, all in Elko County; noted at Lehman Creek, May 27, 1932, and on Wheeler Peak, August 16, 1932, both in White Pine County; several on Silver Peak, Esmeralda County, November 22, 1934.

Hylocichla guttata auduboni. Hermit Thrush. One taken at Wheeler Peak, White Pine County, August 16, 1933.

Sialia currucoides. Mountain Bluebird. Charles Sheldon Refuge, Washoe County, September 4, 1931, and May 30, 1948; Star Valley and Lamoille, May 30, 1932, and near the Ruby Mountains, at Lamoille, and at Elko, August 18, 1933, all in Elko County; common, Muddy Creek, Clark County, November 20, 1934.

Myadestes townsendi. Townsend Solitaire. Two on Pine Nut Mountain, Douglas County, October 7, 1932; one taken in Hidden Forest, Clark County, November 21, 1934.

Polioptila melanura. Black-tailed Gnatcatcher. Two at Nelson, Clark County, November 19, 1934.

Regulus calendula cineraceus. Ruby-crowned Kinglet. A female taken on October 8, 1932, Fish Lake Valley, Esmeralda County; noted, Pine Creek Ranch, Nye County, October 10, 1932; noted at Nelson, November 19, 1934, and a female taken at St. Thomas, both in Clark County, November 20, 1934.

Anthus spinoletta. Water Pipit. Numbers at Charles Sheldon Refuge, Washoe County, September 4, 1931; four at Pine Creek Ranch, Nye County, October 10, 1932.

Phainopepla nitens lepida. Phainopepla. A male taken at Glendale, Clark County, November 20, 1934.

Lanius ludovicianus. Loggerhead Shrike. Shrikes are relatively abundant in Nevada. I have the following skins that A. H. Miller has identified as *L. l. nevadensis*: a male from Fernley, Washoe County, November 8, 1932; male, Nelson, Clark County, November 19, 1934; male, Minden, Douglas County, November 4, 1934; and a male and female at Eureka, Eureka County, August 14, 1933. He also considered a female taken on August 17, 1933, at Baker Creek, White Pine County, as intermediate between *nevadensis* and *gambeli*, but nearer to *nevadensis*. The following sight records probably also belong under the race *nevadensis*: Carson Sink, Churchill County, October 12, 1932, and August 11, 1933; common, Austin, Lander County, and Eureka, Eureka County, August 14, 1933; Ely, White Pine County, August 16, 1933; Walker Lake, Mineral County, November 16, 1934; Tonapah, Nye County, November 16, 1934; and Nelson and Las Vegas, Clark County, November 19, 1934.

Two skins from Elko County were identified by A. H. Miller as *L. l. gambeli*: a female taken at Secret Pass, August 18, 1933, and a male taken on the head of the Owyhee River, August 19, 1933. It is probable that sight records from Elko County north of these points also belong under this race. I noted shrikes at Wells, May 29, 1932, at Star Valley and Lamoille, May 30, 1932, at Elko, May 31, 1932, and at Tuscarora, June 1, 1932.

Vermivora celata. Orange-crowned Warbler. Tuscarora, June 1, 1932, and Harrison Pass, Ruby Mountains, June 1, 1948, both in Elko County.

Dendroica petechia. Yellow Warbler. Wells, May 29, 1932, Tuscarora, June 1, 1932, Lamoille, August 18, 1933, and head of Humboldt River, August 19 and 20, 1933, all in Elko County; Ely, White Pine County, May 28, 1932.

Dendroica nigrescens. Black-throated Gray Warbler. Near Eastgate, Churchill County, August 14, 1933.

Opornis tolmiei. Tolmie Warbler. Mount Rose, Washoe County, August 12, 1933; Lamoille, August 18, a male taken at Secret Pass, August 18, and a female at Tuscarora, August 19, noted at heads of the Little Humboldt and Owyhee rivers, August 19, 1933, and at Harrison Pass, Ruby Mountains, June 1, 1948, all in Elko County.

Geothlypis trichas occidentalis. Yellow-throat. Two, Fish Lake Valley, Esmeralda County, October 8, 1932; specimens taken, Carson Sink, Churchill County, August 11, 1933; noted, Lamoille, Elko County, August 18, 1933.

Icteria virens auricollis. Yellow-breasted Chat. Lamoille, August 18, 1933, and Harrison Pass, Ruby Mountains, June 1, 1948, both in Elko County.

Wilsonia pusilla. Pileolated Warbler. Head of Humboldt River, Elko County, August 20, 1933.

Passer domesticus. English Sparrow. Virgin Valley, Humboldt County, May 30 and 31, 1948; Ely, White Pine County, May 28, 1933; Fish Lake Valley, Esmeralda County, October 9, 1932; Pine Creek Ranch, Nye County, October 9, 1932; Lamoille and Elko, Elko County, August 18, 1933.

Sturnella neglecta. Western Meadowlark. Charles Sheldon Refuge, September 5, 1931, and May 30, 1948, Mount Rose, August 12, 1933, both in Washoe County; Star Valley and Lamoille, May 30, 1932, Lamoille and Elko, August 18, 1933, and head of Humboldt and Owyhee rivers, August 19 and 20, 1933, all in Elko County; Ely, August 14, 1933, and between Ely and Wheeler Peak, August 16, 1933, both in White Pine County.

Xanthocephalus xanthocephalus. Yellow-headed Blackbird. Common, Virgin Valley, Charles Sheldon Refuge, Humboldt County, May 30 and 31, 1948.

Agelaius phoeniceus. Red-winged Blackbird. Noted at Austin, Lander County, May 27, 1933; numerous near Wells, May 29, Lamoille and Elko, May 30, and near Tuscarora, June 1, 1932, and also noted on the Little Humboldt and Owyhee rivers, August 19 and 20, 1933, all in Elko County; numerous in Paradise Valley, Humboldt County, August 20, 1933; a number of flocks about Minden, Douglas County, October 7, 1932.

Icterus bullockii. Bullock Oriole. Virgin Valley (Charles Sheldon Refuge), Humboldt County, May 30, 1948; Lamoille, May 30, 1932, Wells, May 29, 1932, and Tuscarora, June 1, 1932, all in Elko County; female taken, Wheeler Peak, White Pine County, August 16, 1933.

Euphagus cyanocephalus. Brewer Blackbird. Common, Lamoille and Star Valley, May 30, 1932,

and head of Humboldt and Owyhee rivers, August 19 and 20, 1933, all in Elko County; common, Walker Lake, Mineral County, October 8, 1932; common, Pine Creek Ranch, Nye County, October 10, 1932.

Molothrus ater. Brown-headed Cowbird. Six individuals, Harrison Pass, Ruby Mountains, Elko County, June 1, 1948.

Piranga ludoviciana. Western Tanager. May 30, 1932, Star Valley and Lamoille, and May 31, numbers in migration along the roadsides of the Humboldt National Forest, all in Elko County.

Passerina amoena. Lazuli Bunting. Common about a camp north of Tuscarora, June 1, 1932, and in Harrison Pass, Ruby Mountains, Elko County, June 1, 1948.

Hesperiphona vespertina. Evening Grosbeak. Two birds about a camp north of Tuscarora, Elko County, June 1, 1932.

Carpodacus cassinii. Cassin Finch. A female taken near Austin, Lander County, October 10, 1932.

Carpodacus mexicanus frontalis. House Finch. Common, Wells, May 29, 1932, and Lamoille and Elko, May 30, 1932, all in Elko County; noted, Ely, White Pine County, May 27, 1932; Fish Lake Valley, Esmeralda County, October 8, 1932; Pine Creek Ranch, Nye County, October 10, 1932; a female taken at Reno, Washoe County, August 13, 1933.

Spinus pinus. Pine Siskin. Noted between Eureka and Ely, White Pine County, May 28, 1932; Wells, Elko County, May 29, 1932; several, Mount Rose, Washoe County, August 12, 1933; two, Virgin River Valley, Clark County, November 20, 1934; flock of 15-20 at Ruby Lakes Refuge headquarters, Elko County, June 1, 1948.

Spinus tristis pallidus. American Goldfinch. Wells and Lamoille, Elko County, May 30, 1932; Carson Sink, Churchill County, August 11, 1933; two at the Searchlight ferry, Clark County, November 19, 1934; a female taken November 17, 1934, at Twin Springs, Nye County; two noted, Virgin Valley, Clark County, November 20, 1934; one, Ruby Lakes Refuge headquarters, Elko County, June 1, 1948.

Spinus psaltria. Arkansas Goldfinch. Star Valley and Lamoille, Elko County, May 30, 1932; north of Elko on the edge of the Humboldt National Forest on May 31, 1932; two birds at the Searchlight ferry, Clark County, November 19, 1934.

Chlorura chlorura. Green-tailed Towhee. A female taken, Tahoe Meadows, Washoe County, August 12, 1933; a female taken, Baker Creek, Wheeler Peak, White Pine County, August 16, 1933; noted, Secret Pass and Lamoille, August 18, 1933, and head of Humboldt River, August 20, 1933, all in Elko County; Paradise Valley, Humboldt County, August 20, 1933.

Pipilo maculatus. Spotted Towhee. A nest containing four nearly fledged young found on Lehman Creek, White Pine County, May 27, 1932.

Passerculus sandwichensis nevadensis. Savannah Sparrow. Common, Wells, May 29, 1932, Star Valley and Lamoille, May 30, 1932, Tuscarora, June 1, 1932, and head of Humboldt River, August 20, 1933, when a male was taken, all in Elko County; common, Carson Sink, Churchill County, August 11, 1933.

Poocetes gramineus confinis. Vesper Sparrow. Tuscarora, June 1, 1932, male taken, Secret Pass, August 18, 1933, Lamoille and Elko, August 18, 1933, head of Owyhee and Humboldt rivers, August 19, 1933, all in Elko County.

Chondestes grammacus strigatus. Lark Sparrow. Found near Tuscarora, June 1, 1932, Secret Pass, male and female taken on August 18, 1933, noted at the head of the Owyhee and Humboldt rivers, August 19 and 20, 1933, and at Ruby Lakes, June 1, 1948, all in Elko County; Paradise Valley, Humboldt County, August 20, 1933.

Amphispiza bilineata deserticola. Black-throated Sparrow. Specimens taken at Nelson, Clark County, November 19, 1934.

Amphispiza belli. Sage Sparrow. Common, August 20, 1933, Paradise Valley, Humboldt County; Wells, May 29, 1933, Star Valley and Lamoille, May 30, 1932, head of Humboldt and Owyhee rivers, August 19, 1933, all in Elko County; Fish Lake Valley, Esmeralda County, October 9, 1932; Pine Creek Ranch, Nye County, October 10, 1932; Las Vegas, Nelson, and Searchlight, common November 19, 1934, common Virgin Valley, November 20, 1934, all in Clark County. Specimens of *A. b. nevadensis* taken at Nelson, Clark County, November 19, 1934. A male of *A. b. canescens* was taken at Coaldale, Esmeralda County, October 9, 1932.

Junco oreganus. Oregon Junco. Specimens of *J. o. shufeldti* taken at Potts Post Office, Nye County,

October 10, 1932, and St. Thomas, Clark County, November 20, 1934; one that is apparently *shufeldti* tending toward *montanus* taken at Hidden Forest, Clark County, November 21, 1934. Male and female of *J. o. thurberi* taken at Tahoe Meadows, Washoe County, August 12, 1933; common, Silver Peak, Esmeralda County, October 22, 1934.

Junco caniceps caniceps. Gray-headed Junco. Five collected near timberline on Wheeler Peak, White Pine County, August 16, 1933.

Spizella passerina arizonae. Chipping Sparrow. Common, Tahoe Meadows, Washoe County, August 12, 1933; abundant, and a female taken on Wheeler Peak, White Pine County, August 16, 1933; a female taken at Secret Pass, Elko County, August 18, 1933; fairly common, Pine Nut Mountain, Douglas County, August 22, 1933.

Spizella breweri breweri. Brewer Sparrow. Common, Charles Sheldon Refuge, Washoe County, September 4, 1931; Paradise Valley, August 20, 1933, and Virgin Valley, May 30, 1948, both in Humboldt County; Wells, May 29, Star Valley and Lamoille, May 30, Tuscarora, May 31, Secret Pass and Lamoille, August 18, Ruby Valley, August 17, head of the Humboldt and Owyhee rivers, August 19 and 20, 1933, all in Elko County; a male collected at Belmont, Nye County, October 9, 1932; common, Carson Sink, Churchill County, August 11, 1933; Ely and Wheeler Peak, White Pine County, August 16, 1933; common, Nelson, Clark County, November 19, 1934, when one was taken.

Zonotrichia leucophrys. White-crowned Sparrow. Noted, Harrison Pass, Ruby Mountains, Elko County, June 1, 1948; specimen of *Z. l. oriantha* taken at Tahoe Meadows, Washoe County, August 12, 1933. Specimens of *Z. l. gambelii* taken: Fish Lake Valley, Esmeralda County, October 8, 1932; Minden, Douglas County, male, November 4, 1934; Caliente, Lincoln County, male, November 18, 1934; and St. Thomas, Clark County, male, November 20, 1934.

Passerella iliaca. Fox Sparrow. Two specimens of *P. i. schistacea*: male, Secret Pass, August 18, 1933, and female, Tuscarora, August 19, 1933, both in Elko County. A male taken at Secret Pass, Elko County, August 18, 1933, has been identified as *P. i. fulva*. A female taken in the Tahoe Forest, west of Carson City, Ormsby County, August 12, 1933, represents *P. i. monoensis*.

Melospiza melodia. Song Sparrow. Noted at Ely, White Pine County, May 20, 1932; Wells, Star Valley, and Lamoille, May 30, 1932, Tuscarora, June 1, 1932, several at Lamoille, August 18, 1933, a number on the head of the Owyhee and Humboldt rivers on August 19 and 20, 1933, all in Elko County; specimens of *M. m. montana* from Nelson, Clark County, taken November 19, 1934, and others taken November 20, 1934, at St. Thomas. Specimens of *M. m. fisherella* taken at Carson Sink, Churchill County, August 11, 1933, and Minden, Douglas County, November 4, 1934.

Wildlife Management Institute, Washington, D.C., November 24, 1948.

FROM FIELD AND STUDY

Distribution of the Pacific Kittiwake in November and December of 1948.—The winter range of the Pacific Kittiwake (*Rissa tridactyla pollicaris*) is known to extend over the offshore waters of the Pacific coast to southern California (Grinnell and Miller, Pac. Coast Avif. No. 27, 1944:170). The following information is recorded in the hope that it will eventually be useful in formulating a more complete picture of the fall and winter movements of this species. The observations were made aboard the Motor Ship "Black Douglas" between November 11, when we entered the Gulf of Alaska, and December 18, 1948, when we entered the Strait of Juan de Fuca, returning to Seattle, Washington. Six to eight hours a day were spent in observation. Alternate hours from sunrise to sunset were spent in the ship's pilot house.

Although we saw no Kittiwakes in the Gulf of Alaska, we saw them from Kodiak Island well into the Bering Sea and in the waters off southern California. We observed only a scattered few as far as 100 miles into the Bering Sea. Except for darkness we might have seen them all the way to the Pribilof Islands.

We left Unalaska, in the Aleutian Chain, on November 26 and headed for San Francisco on the great circle route. No Kittiwakes were encountered until we were more than halfway across the North Pacific. When approximately 800 miles northwest of San Francisco on December 2, we again saw them but only at the rate of two or three a day until our last day out, December 6.

We noted that Kittiwakes were concentrated in several widely separated areas. In Whale Pass, near Kodiak Island, on November 17, we saw an estimated one to two hundred birds and a somewhat smaller number on November 19 in Unimak Pass near Unalaska. As we approached San Francisco on December 6, the Kittiwake was the most abundant bird during the day's run from about 100 miles northwest of the Golden Gate to the Farallon Islands. We saw an estimated 150 to 200 birds of this species. They were notably numerous again on December 11, about 30 miles off Point Concepcion, California, as we entered the open sea from the shelter of San Miguel Island and ran northward parallel to the coast.

After leaving the waters off central California on December 15, on our northward cruise, the birds became increasingly scarce and we saw comparatively few north of California, off Oregon and Washington. The last bird observed was an immature individual seen twelve miles inside the Strait of Juan de Fuca on December 19.

During the period of our cruise the Pacific Kittiwake appeared generally most abundant between December 6 and 14, in the waters off central California from about 25 to 50 miles offshore. Of the total number observed in this area approximately two-thirds were immature. Farther north, in the Aleutian area, on the other hand, the immature birds did not appear to be predominant.

The question as to how the Kittiwakes reach California waters might be answered by future observations at sea. Do they straggle toward California singly and in small groups dispersed over the North Pacific, or do they migrate by way of a more easterly route and not directly across from the Aleutian area? The fact that we encountered none for the first 1200 miles after leaving the Aleutians and then encountered scattered individuals during the several days before reaching California waters favors the latter possibility.

Apparently the last specimen of the Pacific Kittiwake collected in the San Diego area was one recorded by Anthony in 1897 (Auk, 15, 1898:267). While on the beach at La Jolla on January 2, 1949, I saw an immature bird of this species fly close overhead several times. One side of the breast was quite heavily smeared with oil. This, in conjunction with the brisk northwest storm winds of the previous two days, probably accounted for its occurrence near shore and somewhat south of its normal winter range.—KARL W. KENYON, *United States Fish and Wildlife Service, Seattle, Washington, March 16, 1949.*

Steller Jay Flies South in the Spring.—A Steller Jay (*Cyanocitta stelleri*) banded in Boulder, Colorado, on February 21, 1948, was reported dead on July 16, 1948, 13 miles west of Mountainair, extreme western Torrance County, New Mexico, about 50 miles east-southeast of Albuquerque. The band was returned to me and the number (41-340996) verified. It is usually held that the movements of jays are confined to concentration at generally lower altitudes (5000 to 9000 feet) in winter and dispersal over wider areas at higher altitudes (5000 to 11,000) in summer (Bent, U. S. Nat. Mus.

Bull. 191, 1946:73; Bailey, Birds of New Mexico, 1928:474). The action of the banded bird seems entirely in accord with such movements, since the banding station is at 5500 feet, and the recovery area was reported as about 8500 feet, pine-juniper-oak association, on the eastern slope of the Manzano Mountains. But other circumstances mark this flight as peculiar. Mountainair is almost exactly 400 air-line miles south-southwest of Boulder. But a flight in this direction would have to lead across the Sangre de Cristo range at an elevation of 12,500 feet; more probably the bird would follow an arc along the mountain front and cover a total minimum distance of 450 miles.—JOHN N. HOUGH, *Boulder, Colorado, February 1, 1949.*

Brood Size in the Barn Owl.—The accompanying tabulation summarizes the numbers of young of the Barn Owl (*Tyto alba*) that I have observed in 87 nests of this species at Escondido, San Diego County, California, from 1928 to 1946, inclusive. This record includes 12 fledglings that escaped before I could band them.

Young in nest	Frequency
1	3
2	9
3	11
4	28
5	18
6	14
7	4

The 366 young noted represent an average of 4.2 young per nest. In some years the annual mean was as high as 4.6 (10 nests in 1933) and as low as 3.3 (11 nests in 1934). If equally striking fluctuations were present in this region in other years, they were masked by the small size of the sample annually studied. I am indebted to Dr. J. J. Hickey for assistance in the analysis of data.—FRED N. GALLUP, *Escondido, California, February 5, 1949.*

Mating of Wild and Pinioned Canada Geese.—Mr. Roy Nichols, a rancher near Davenport, Lincoln County, Washington, has been raising Canada Geese (*Branta canadensis*) from stock obtained originally from game dealers, and to this stock he has recently added individuals from the eastern United States, probably of the race *B. c. canadensis*. Locally a few Canada Geese nest, and thousands of them migrate through this section of the state.

In the spring of 1948, Mr. Nichols had one male and four females, all pinioned, when, on March 24, 1948, eight wild Canada Geese, presumably *B. c. moffitti*, landed among his pinioned stock and remained with them throughout the night. The following day seven of the wild birds left; a large gander remained and mated with a two-year old goose. For a time the gander was quite "wild" but gradually he became more accustomed to Mr. Nichols. This pair nested near a small marsh near his barn, placing the nest in the open along a woven-wire fence. They brought forth four young on May 20 and these were raised successfully. According to Mr. Nichols, this is the first time that he has ever had wild Canada Geese mate with his pinioned stock although wild birds have occasionally been "decoyed in" by his birds during migration.

He reports further that the pinioned geese called in what seemed to be a very distressed manner when the eight wild birds flew from his barnyard on the evening of March 24 and were able to cause the wild birds to return and stay for the evening. He had never heard geese call in such a manner throughout the years that he has had Canada Geese. The gander that stayed with his flock mated immediately with the two-year old goose and has never left the vicinity of the ranch buildings since the first evening that the wild birds remained with his pinioned geese. He has been able to get the gander into his chicken house by herding in the entire flock.—CHARLES F. YOCOM, *Department of Zoology, State College of Washington, Pullman, Washington, October 28, 1948.*

The Franklin Gull in Oregon.—During the past few years rumors of the occurrence of Franklin Gulls in east-central Oregon have reached me. In discussing this matter last spring with John C. Scharff he assured me that a number of these birds had been nesting on the Malheur National Wildlife Refuge in the past few years. Recently I received a frozen specimen of *Larus pipixcan* and a photograph of a nest and three eggs of this species from Dr. Ray C. Erickson. This specimen, an



Fig. 31. Nest of Franklin Gull at Malheur Refuge, Oregon, June 7, 1948.

adult female with the characteristic bare incubation patch of a nesting bird, was taken on the south part of the Malheur Refuge on May 26, 1947. The nest was built of hardstem bulrush and was floating in about four feet of water. The three eggs were incubated from four to seven days when collected by Dr. Erickson on June 7, 1948. According to Erickson, in 1947 there were 75 to 100 Franklin Gulls living on Malheur Lake, presumably nesting residents. The principal concentration was found in a large, fairly dense stand of hardstem bulrush about one and one-half miles west and north of the trapper's cabin on Cole Island Dike. Very few of these gulls were seen on any other part of the Refuge. —STANLEY G. JEWETT, *Portland, Oregon, February 1, 1949*.

Townsend Solitaire in the Coast Range of Oregon.—Gabrielson and Jewett (*Birds of Oregon*, 1940:480-481) record the Townsend Solitaire (*Myadestes townsendi*) as a permanent resident that breeds in the Cascade and Blue mountains and note that it straggles more or less regularly to western Oregon after the breeding season. Several fall, winter and early spring records for western Oregon then follow, and mention is also made of manuscript notes in the files of the Biological Survey, which include a record for Wilson River, Tillamook County, on June 27, 28, 1897 (A. K. Fisher). In the light of more recent observations the lateness of this date is significant.

On July 7, 1942, a solitaire was seen by Kenneth M. Walker on Mary's Peak, in Benton County. On July 15, 1944, I collected a female solitaire at 3100 feet elevation on Mount Hebo, Tillamook County, and on June 18, 1945, a male with enlarged gonads was taken at the same place. On a trip to the top of Saddle Mountain, in Clatsop County, on May 3, 1947, a solitaire was seen by Wesley Batterson and myself. On July 8, 1947, Mr. Batterson saw an adult solitaire feeding a spotted young, 7 miles northwest of Jewel, in Clatsop County, and on July 16 he collected a young bird in the spotted plumage on the divide between Wilson River and the north fork of the Trask River, 12 miles east of Tillamook. This bird is now a study skin in my collection. On June 5, 1948, Peter P. Walker, Jr., took me to the nest of a solitaire he had discovered well up on the side of the hill above Wilson River, near the mouth of Cedar Creek, 16 miles northeast of Tillamook, in the desolate Tillamook burn. No green timber of any sort is found in this area, only dead trees, both standing and fallen, nor is there any brush or other low growth. The nest was situated in a slight cavity in the earth left clinging to the upturned roots of a large fallen tree. The loosely made structure of rootlets and grass stems was partly supported by the roots of the tree and contained four eggs, incubation of which was well started. Since the nest was in the direct path of logging operations under way to salvage some of the dead timber and would have been destroyed in a few days, it was photographed and collected. From the foregoing observations we may conclude that the Townsend Solitaire is probably a regular, though uncommon, breeding bird in the Coast Range of western Oregon. —ALEX. WALKER, *Tillamook, Oregon, March 15, 1949*.

NOTES AND NEWS

The Grayson painting reproduced in this issue shows a pair of Yellow Grosbeaks, native of Sinaloa, perched on a flowering silk-cotton tree, *Bombax ellipticum* (Family Bombacaceae).

This colored plate is presented through the generosity of W. J. Sheffler to whom the readers of *The Condor* are greatly indebted.

Dr. Robert W. Storer has recently joined the staff of the Museum of Zoology of the University of Michigan as Assistant Curator of Birds.

COOPER CLUB MEETINGS

SOUTHERN DIVISION

MARCH.—The regular monthly meeting of the Southern Division of the Cooper Ornithological Club was held on March 29, 1949, at 145 Allan Hancock Hall, University of Southern California. The following names were proposed for membership: William M. Hughes, 8755 SW. Marine Dr., Vancouver, B.C., Canada, by Mary M. Erickson; Miss Adelia Mabe, 294 S. Wilson Ave., Pasadena 5, Calif., by Joe T. Marshall, Jr.; Dick Schonert, Rt. 6, Box 1364, Modesto, Calif., by W. L. Chambers; Walter Norton Schneider, 494-B 41st St., Oakland 9, Calif., by Paul F. Covel; Ashley Alvin Thornburg, Vetsville, Trailer J-10, Boulder, Colo., by Gordon Alexander; Clarence A. Barnes, 3742 Coldwater Canyon, No. Hollywood, Calif., Clayton Charlton Denman, 1751 Naomi Place, Seattle 5, Wash., C. Stuart Francis, Spruce Dale Farm, Torch River, Saskatchewan, Canada, William V. Garner, 447 E. Wadsworth, Philadelphia 19, Pa., Bess M. Hoffman, 1112½ S. Orange Dr., Los Angeles 35, Calif., John O. Johnson, 112 7th St., SW., Watertown, So. Dakota, Robert C. Kletzly, U.S.D.A. Bldg., Conservation Commission, Elkins, West Virginia, Charles Corbett Laing, 762 N. Van Buren St., Milwaukee 2, Wis., Jane S. Mengel, 20 E. Shore Dr., Whitmore Lake, Michigan, and Albert Roland Singleton, 3968 Marburg Ave., Cincinnati 9, Ohio, all by C. V. Duff.

Colored motion pictures of an interesting feeding behavior pattern in shoveller ducks and of animal life in the Yellowstone were shown by Mr. J. R. Pemberton and Mr. Melville N. Lincoln, respectively.—D. E. GRONER, *Secretary*.

NORTHERN DIVISION

MARCH.—The regular meeting of the Northern Division of the Cooper Ornithological Club was held on Thursday, March 24, 1949, in Room 2503 Life Sciences Building, University of California,

Berkeley, California. The following names were proposed for membership: Ronald M. Murren, 2629 Maste St., Berkeley 4, Calif., by Lois C. Taylor; Herbert O. Hill, 2420 Ridge Road, Berkeley 9, Calif., by A. S. Leopold; Miss Elizabeth Polhemus, Dept. of Zoology, University of California, Berkeley 4, Calif., by R. A. Ronkin; and Joseph T. Herberger, 959 S. Downing, Denver 9, Colorado, by F. A. Pitelka.

Four reels of Kodachrome movies of common land and water birds of central California taken by Mr. Andrew Shirra Gibb were shown.—H. L. COGSWELL, *Secretary*.

APRIL.—The regular monthly meeting of the Northern Division of the Cooper Ornithological Club was held on Thursday, April 28, 1949, in Room 2503 Life Sciences Building, University of California, Berkeley, California. The following proposals for membership were read: Mr. Darl E. Bowers, 1934 Virginia St., Berkeley, Calif., by Howard L. Cogswell; Harold C. Hedges, Rt. 2, Lake Quivira, Kansas City 3, Kans., by Chas. G. Sibley; Paul H. Johanson, 1285 Marion St., Kingsburg, Calif., by Frank A. Pitelka; Mrs. Marietta Voge, Dept. of Zoology, University of California, Berkeley 4, Calif., by Lois C. Taylor; and Mrs. William (Mary Elizabeth) Newton, 1082 Miller Ave., Berkeley 8, Calif., Mrs. Harold P. Henningsen, 124 Cambridge Way, Piedmont 11, Calif., Mrs. S. R. Bowman, 51 Marr Ave., Oakland, Calif., Mrs. Mark L. Hamlin, 6433 Oakwood Dr., Oakland 11, Calif., James B. Linford, 538 Fairbanks Ave., Oakland 10, Calif., and Mrs. George Neldam, 304 La Espiral, Orinda, Calif., all by Mrs. Junea W. Kelly.

An illustrated talk entitled "A Summer Trip to Alaska on the Alaskan Highway" was given by Mr. Fred L. Jones.—H. L. COGSWELL, *Secretary*.

GOVERNORS' MEETING

The 24th annual meeting of the Board of Governors of the Cooper Ornithological Club was held on April 8, 1949, at the University Club, 614 South Hope Street, Los Angeles, California. President Ed N. Harrison called the meeting to order at 8:00 p.m., with the following members present: W. Lee Chambers, C. V. Duff, Dorothy E. Groner, W. C. Hanna, Ed N. Harrison, Hildegarde Howard, Junea W. Kelly, Alden H. Miller, R. T. Moore, H. R. Panton, J. R. Pemberton, Sidney B. Peyton, Frank A. Pitelka, Howard

Robertson, W. J. Sheffler, K. E. Stager, and S. F. Wood. Guests present were Lois C. Taylor and Stanley G. Jewett.

Minutes of the 23rd meeting were read and approved. The report of the Business Manager was submitted by W. Lee Chambers. A discussion of printing costs ensued. The report was accepted following a motion by Miller, seconded by Duff. On the motion of Moore, seconded by Pemberton, the business managers were extended a vote of thanks for able handling of the club's finances.

The report of the Auditing Committee was submitted by S. F. Wood, indicating the the accounts and securities of the Club were in order. This report was accepted on the motion of H. Robertson, seconded by Mrs. Kelly.

A. H. Miller presented the report of the editors of *The Condor*. Costs of publication have not increased over the previous year and are fractionally less. Noteworthy features of volume 50 were reviewed. It was emphasized that procurement of good papers continues to be a problem. Following Miller's statement, plans for the publication of reproductions of paintings by Andrew Jackson Grayson were described by F. A. Pitelka and Mrs. Lois C. Taylor. On the motion of Wood, seconded by Moore, the report of the editors was accepted.

It was suggested by W. Lee Chambers that the Club should initiate a policy of having its treasurer and business managers bonded. On the motion of H. Robertson, seconded by Painton, this suggestion was tabled.

On the motion of H. Robertson, seconded by Moore, President Harrison was directed to appoint a committee to study the by-laws with regard to revisions, need for which has been increasingly apparent.

Mrs. Junea W. Kelly was elected as alternate representative on the Council of the American Ornithologists' Union. Results of election of officers were as follows: president, E. N. Harrison; vice-president, Frank A. Pitelka; secretary, Kenneth E. Stager; editor, A. H. Miller. On the motion of H. Robertson, seconded by Moore, A. H. Miller was authorized to appoint such editorial associates as required.

Adjourned.—FRANK A. PITEKA, *Secretary*.

ANNUAL BUSINESS MEETING

The first session of the annual business meeting of the Cooper Ornithological Club was called to order by President Alden H. Miller at 10:10 a.m., Friday, April 8, in the lecture hall of the Los Angeles County Museum, Exposition Park, Los

Angeles, California. The minutes of the last business meeting, held in Asilomar in May, 1948, were read and approved. The President appointed the following committees: Committee to examine proxies, Kenneth E. Stager, chairman, Sidney B. Peyton and J. R. Pemberton; committee to present nominations for the Board of Directors, W. Lee Chambers, chairman, Stanley Jewett and Robert W. Storer.

As there was to be no meeting of the Southern Division in April, the following proposals for membership were read: Clifford James MacFayden, 816 Duplex Ave., Toronto 12, Ontario, Canada, and Reverend Edward Cronin Greer, 422 East 10th St., Davenport, Iowa, both by C. V. Duff; E. J. Wellington, 11711 Ohio Ave., Los Angeles 25, by W. Lee Chambers; and John J. Cleary, 2806 Glen Ave., Altadena, by Mary M. Erickson. The first session was then adjourned.

The second session of the annual business meeting was called to order in the lecture hall of the Los Angeles County Museum by President Miller at 9:50 a.m., April 9, 1949. Mr. Stager, reporting for the proxy committee, stated that of the 1307 members eligible to vote at this time, 666 were represented by proxies. Sixty members were present in person. A quorum was declared present.

Dr. Miller called upon C. V. Duff to give a report for the business management. After indicating the sound financial condition of the Club, Mr. Duff said that by continuing to build the membership we may be assured of continuing success and suggested that each member present endeavor to get at least one new member. He brought out the need for more life memberships and indicated that these may be purchased in four annual payments. Mr. Duff further stated that owing to the generosity of certain members of the Club, money is now available for publication of two more Grayson plates in the *Condor*. He expressed the hope that in response to the letter which all members are about to receive relative to the Grayson plates, it would be possible to print several more.

Mr. Chambers, reporting for the nominating committee, proposed names of the following persons for membership on the Board of Directors: C. V. Duff, W. I. Follett, Ed N. Harrison, Hildegard Howard, Jean M. Linsdale, Alden H. Miller, J. R. Pemberton, Sidney B. Peyton, and Kenneth E. Stager. It was moved, seconded and carried that the nominations be closed and the secretary be instructed to cast a unanimous ballot for the nominees.

Adjourned.—HILDEGARDE HOWARD, *Secretary*.

For Sale, Exchange and Want Column—Each Cooper Club member is entitled to one advertising notice in any issue of *The Condor* free. Notices of over five lines will be charged for at the rate of 25 cents per line. For this department, address SIDNEY B. PEYTON, *R. R. No. 2, Box 260, Fillmore, Calif.*

NOTICE—To members of the Cooper Ornithological Club who have not paid their dues for 1949, may I remind you that dues are now payable. Your remittance will be most gratefully received.—SIDNEY B. PEYTON, *Treasurer, R. D. 2, Box 260, Fillmore, California.*

FOR SALE—An accumulation of "The Auk," including vols. 4, 13, 14, 15, and nearly all from vols. 22 through 60; also odd numbers of all volumes. These will be sent anywhere in the U. S., postpaid, at just half the regular price. Here is a good chance to fill some of the gaps in your set.—W. LEE CHAMBERS, *Topanga, California.*

WANTED—Auk, vol. 1, nos. 2 and 3; vol. 2, nos. 2 and 4; vol. 3, no. 4; vol. 4, no. 1; vol. 5, nos. 1 and 4; and vol. 6, nos. 1 and 3. Also Bulletin of the Nuttall Ornithological Club, vol. 1, July and October, and vol. 2, July and October. Will pay good price for wanted issues or entire volumes.—IRA N. GABRIELSON, *Wildlife Management Institute, Investment Bldg., Washington 5, D. C.*

FOR SALE—Bent's Life Histories, bulletins nos. 113-195 incl., fifteen volumes, all numbers in excellent condition. Make me an offer.—VICTOR E. JONES, *Idaho State College, Pocatello, Idaho.*

FOR SALE—Bent's Life Histories, no. 170, Birds of Prey, part II, \$7.00; no. 174, Woodpeckers, \$6.00; no. 176, Cuckoos, Goatsuckers, Hummingbirds, \$6.00; no. 179, Flycatchers, Larks and Swallows, \$6.00. All the above are in perfect condition as new and partly uncut. Postpaid anywhere in the U. S.—FRANK N. BASSETT, *722 N. Orange Drive, Los Angeles 38, California.*

FOR SALE—Diseases in Captive Wild Mammals and Birds, by Herbert Fox, M.D. (Phila., 1923), publ. at \$12.00. A few copies left at \$7.78, postpaid. California purchasers add 19¢ sales tax.—F. N. BASSETT, *722 N. Orange Drive, Los Angeles 38, California.*

FOR SALE—Bent's Life Histories, bulletins nos. 107 to 195, complete, sixteen volumes, paper covers, excellent condition. Nos. 107 and 121 are original edition. Also, Auk, 1917-1948, inclusive, paper covers. Make offers.—WENDELL TABER, *3 Mercer Circle, Cambridge 38, Massachusetts.*

WANTED—Fourth edition of the A. O. U. Check-list. Will pay reasonable price for a usable copy.—H. E. CHILDS, JR., *Museum of Vertebrate Zoology, Berkeley, California.*

A BARGAIN—Odd volumes of the *Condor* in good second-hand condition. We have a few left and can supply most any from volume 8 to date.

This is the last time we will issue this add and if you wish to complete your file of the *Condor* at just half the regular prices, send in your order at once.—COOPER ORNITHOLOGICAL CLUB, *Topanga, California.*

PREPARATION OF MANUSCRIPTS FOR THE CONDOR

Articles published in the Condor normally are written by members of the Cooper Ornithological Club. Practically all the Club's money goes into the magazine; no editor and no business manager receive any pay other than the satisfaction of doing a service worthily. The preparation of good copy by the author will contribute greatly to accuracy of published output, dispatch in handling, and economy of production.

To be acceptable for inclusion in the Condor, articles must not duplicate in any substantial way material that is published elsewhere. Any type of subject bearing on birds may be considered; but the geographic areas of primary concern are western North America, Central America, and the Pacific Basin. Manuscripts may be submitted to any one of the editors (see inside front cover for address). Proofs with edited manuscripts will be sent to authors, at which time reprints may be ordered.

In the interests of accuracy and economy, observe the following: do not duplicate data in text, tables, or charts; check citations to original sources and verify text references; quoted statements must be exact replicas of the original; preferably use vernacular names applicable to the entire avian species (for a guide in this regard, see "The Distribution of the Birds of California," *Pac. Coast Avif.* No. 27, 1944:5-34); in general, avoid subspecific vernaculars; insert scientific names for species but not the subspecific name except in taxonomic papers or where the race concerned has been critically determined by the author or his collaborators; revise the manuscript repeatedly to remove superfluous words and phrases, immaterial detail, and repetitious statements.

Note Condor style and usage. "General Articles" and the "Field and Study" items are set up in different form. Provide a concise, meaningful title, and, where needed, subtitles within the text. Footnotes are not used. The address line may serve to indicate institutional connection, and to it should be added the date of transmittal of the manuscript. Terminal bibliographies are desirable where five or more titles are to be cited; otherwise, the references may be included in the text. For bibliographic style, note closely the practices employed in recent volumes of the journal. A factual summary is recommended for longer papers.

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Illustrations.—Photographs should be glossy prints of good contrast. Make line drawings with India ink; plan linework and lettering for at least $\frac{1}{2}$ reduction; do not use typewritten labels on the face of the drawing. Provide typed legends on separate sheets.

Helpful references on writing: Manual of Style, University of Chicago Press, and Rules of the Editorial Committee, University of California Press. On scientific nomenclature: A.O.U. Checklist (with supplements 19 through 23) and Pacific Coast Avifauna No. 27; authors are not required to follow either of these works.

THE EDITORS OF THE CONDOR.

